

SUPPLEMENTAL GROUNDWATER INVESTIGATION REPORT

SOUTH CAVALCADE SUPERFUND SITE HOUSTON, TEXAS

Prepared For:

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Prepared by:

Key Environmental, Inc.
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March 1, 2006



215296

KEY ENVIRONMENTAL
INCORPORATED

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LIST OF ABBREVIATIONS/ACRONYMS

AOC	Administrative Order on Consent
ARAR	applicable and relevant and appropriate requirement
Beazer	Beazer East, Inc.
bgs	below ground surface
COC	chain of custody
COI	constituents of interest
DNAPL	Dense Non-Aqueous Phase Liquid
DO	dissolved oxygen
GESPMP	Groundwater Extraction System Performance Monitoring Plan
GFTR	Groundwater Fate and Transport Evaluation
GRAA	Groundwater Remedial Action Area
HCTRA	Harris County Toll Road Authority
IDW	investigation derived waste
KEY	Key Environmental Inc.
Koppers	Koppers Company Inc.
MNA	Monitored Natural Attenuation
NAPL	Non-Aqueous Phase Liquid
NPL	National Priorities List
ORP	oxidation-reduction potential
PID	Photoionization Detector
PPE	personal protective equipment
PVC	polyvinyl chloride
RAWP	Remedial Action Work Plan
RD/RA	Remedial Design and Remedial Action
RDWP	Remedial Design Work Plan
ROD	Record of Decision
SITE	South Cavalcade Superfund Site
SOW	Scope of Work
STL	Severn Trent Laboratory
TCEQ	Texas Commission on Environmental Quality
TDWR	Texas Department of Water Resources
TOC	Total Organic Carbon
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VGFTER	Verification of Groundwater Fate and Transport Evaluation Report
VOCs	Volatile Organic Carbons

SECTION 1.0

1.0 INTRODUCTION

This report was prepared on behalf of Beazer East, Inc. (Beazer) and presents the results of the supplemental groundwater characterization conducted for the shallow and intermediate groundwater-bearing units at the South Cavalcade Superfund Site located in Houston Texas (Figure 1-1). The scope of the field investigation was developed through a series of meetings and communications among representatives of Beazer, U.S. Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ).

The scope of the investigation was discussed with EPA and TCEQ during a meeting in Houston on April 5, 2005 and concurrence regarding the scope of work was achieved. At the meeting, EPA requested that Beazer prepare a brief workplan describing the scope of the investigation and the methodologies to be utilized for its implementation. The workplan was originally submitted to EPA in May 2005. Following receipt of comments from EPA and TCEQ, the workplan was revised to address the comments and resubmitted and subsequently approved on August 17, 2005. Field work was conducted in September 2005. The results of the investigation were presented to and discussed with EPA and TCEQ at a meeting on December 12, 2005. During the meeting, the content of this report was discussed and agreed upon.

The following section (Section 2.0) presents the project objectives. Project background information, including site description, site groundwater remedial history, conceptual model and summary of the operation of the DNAPL recovery system, are included as Section 3.0. Section 4.0 includes a discussion of the implementation of the scope of work. The results of the investigation are presented in Section 5.0 and conclusions and recommendations are included in Section 6.0.

SECTION 2.0

2.0 PURPOSE

The overall purpose of this investigation was to provide additional data to support re-evaluation of the current groundwater remedy for the Site to include a Monitored Natural Attenuation (MNA) component. The specific project objectives were as follows:

- To further define groundwater migration pathways for the shallow and intermediate aquifers, as they pertain to contaminant distributions;
- To refine the delineation of the dissolved phase plume in the area southwest of the Site; and,
- To provide additional data and information to support the design of a MNA monitoring network.

The investigation of the shallow and intermediate zones targeted potential preferential pathways for migration of impacted groundwater from the potential source areas at the Site, as identified through separate analyses of site-specific geologic information performed by Beazer and EPA and as agreed upon during a September 8, 2004 meeting.

As discussed with the EPA and TCEQ during the December 12, 2005 meeting, the content of this report was expanded to include an evaluation of the DNAPL recovery record and presentation of the technical basis for discontinuing recovery, if appropriate.

SECTION 3.0

3.0 SITE BACKGROUND

3.1 SITE DESCRIPTION

This description is largely excerpted from the Verification of Groundwater Fate and Transport Evaluation Report (VGFTER; KEY, 2000). The Site includes approximately 66 acres of urban land located approximately three miles north of downtown Houston, Texas. It is rectangular in shape and is approximately 3,400 feet in the north-south direction by 900 feet in the east-west direction. The Site was operated as a wood treating plant from 1910 until 1962. Creosote and various metal salts were used as the wood preservatives. The wood treating process area was located in the southern portion of the Site along Collingsworth Street. Koppers Company, Inc. (Koppers) operated the wood treating facility from 1940 until its closure in 1962. A coal tar distillation plant was also operated by Koppers on the southeastern portion of the Site from about 1944 until 1962.

The Site is currently occupied by three trucking firms and much of the ground surface is covered by concrete or asphalt pavement, or buildings, as shown on Figure 3-1. The ground surface is also covered in an area where Beazer constructed a concrete cap to cover soil that exceeds the remedial goal specified in the Record of Decision (ROD) for the Site. The central portion of the Site is for the most part undeveloped. However, one of the trucking firms recently expanded its operations into the western portion of the central area. A groundwater treatment facility is located along the eastern Site boundary in the central portion of the Site.

Land use in the vicinity of the Site is a mixture of commercial, industrial and residential. Industrial and commercial properties are located to the east and across Collingsworth Street to the south of the Site. The North Cavalcade Superfund Site, which is also the location of a former wood treating facility, is located directly across Cavalcade Street to the north. Active rail lines immediately border the Site to the east and west. The nearest residences are located several hundred feet west of the Site. The Harris County Toll Road Authority (HCTRA) is planning an extension of the Hardy Toll Road which will border the western Site boundary. As a result, the HCTRA is in the process of acquiring the railroad right-of-way and certain residential properties to the west of the Site.

3.2 SUMMARY OF GROUNDWATER REMEDIAL HISTORY

The following timeline is summarized from the VGFTER (KEY, 2000) and also includes more recent work:

1983 - The Houston Metropolitan Transit Authority investigated the Site for potential use in the municipal mass transit system. Results of this investigation indicated localized areas of potential impact and the Site was subsequently referred to the Texas Department of Water Resources (TDWR).

April 1984 - TDWR recommended to USEPA that the Site be placed on the National Priorities List (NPL). In October 1984, USEPA proposed that the Site be added to the NPL.

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March 1985 - Koppers entered into an Administrative Order on Consent (AOC) to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Site.

June 1986 - The Site was formally added to the NPL.

August 1988 - The RI/FS was completed by Koppers. The Remedial Investigation (Keystone Environmental Resources, July 1988) and Feasibility Study Reports (Keystone Environmental Resources, August 1988) were submitted to USEPA.

September 1988 - A ROD was issued by USEPA which presented the selected remedial alternatives for Site soil and groundwater. The selected remedial groundwater alternative included extraction and treatment of groundwater containing constituent concentrations greater than the remedial goals specified in the ROD. The ROD stipulated that "groundwater collection will continue until constituents have been recovered to the maximum extent possible", as "determined during the Remedial Action, based upon experience in operating the groundwater collection and treatment system." The ROD specified that once USEPA had determined that groundwater constituents have been recovered to the maximum extent possible, groundwater collection would cease and any remaining constituents would be allowed to naturally attenuate to background levels. The ROD also indicated that the groundwater could be remediated via in situ biological treatment if equal performance was demonstrated.

May 1990 - A detailed Statement of Work for the South Cavalcade Site (SOW) was completed by Bechtel Environmental, Inc. (Bechtel) on behalf of Beazer. The SOW described the remedial design and remedial action (RD/RA) activities to be performed by Beazer including pilot study tasks to support the design of the selected remedies.

March 1991 - Beazer entered into a Consent Decree with USEPA for implementation of the RD/RA activities specified in the SOW. The SOW was subsequently incorporated into the USEPA-approved Remedial Design Work Plan (RDWP) prepared by Bechtel on behalf of Beazer, dated March 1992.

October 1993 - Pilot study tasks were completed. A 100% Design Groundwater Collection and ReInjection System and Dense Non-Aqueous Phase Liquid (DNAPL) Recovery System Report was prepared by McLaren/Hart Environmental Engineering Corporation on behalf of Beazer. The Final (100%) Remedial Design Report was submitted to U.S. EPA in December 1994, and was subsequently approved.

June 1995 - Construction of the groundwater remedial action was initiated, in accordance with a USEPA-approved Remedial Action Work Plan (RAWP) dated May 1995 and associated support documents. One DNAPL recovery well (RWN-4) and four groundwater collection wells (RWN-1, RWN-2, RWN-3 and RWN-5) were installed within Groundwater Remedial Action Area (GRAA) 1 located in the north section of the Site. One DNAPL recovery well (RWS-5) and three groundwater collection wells (RWS-3, RWS-4, and RWS-6) were installed within GRAA

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2, which includes the area formerly occupied by the coal tar distillation plant. Two combined groundwater collection/DNAPL recovery wells (RWS-1 and RWS-2) were installed within GRAA 3, which includes the area formerly occupied by the wood treating process area.

September 1995 - Start-up of the groundwater collection and DNAPL recovery components of the groundwater remedy was conducted, following completion of modifications to the groundwater treatment plant.

October 6, 1995 - USEPA prepared a letter to Beazer stating that "there is some question as to whether USEPA will continue to apply the current remedial action goals [i.e., the remedial goals specified in the ROD issued in 1988] to groundwater cleanup." This direction was taken in response to a July 31, 1995 USEPA memorandum directing a policy favoring applicable and relevant and appropriate requirement (ARAR) waivers at sites where it is technically impracticable to remediate groundwater to Federal or State standards. Consequently, and in accordance with an agreement between USEPA and Beazer, groundwater collection and treatment was delayed pending determination of the potential inapplicability of the groundwater remedial goals specified in the ROD. Operation of the DNAPL recovery component of the groundwater remedy continued, and is currently ongoing.

January 1996 - Passive operation of the DNAPL recovery system (i.e. collection of DNAPL without groundwater pumping to increase hydraulic gradients) was initiated in accordance with the USEPA-approved 100% Remedial Design. Evaluation of the DNAPL recovery data collected through June 1996 indicated that DNAPL had been recovered to the "maximum extent possible" under the passive mode of operation. As a result and in accordance with the USEPA-approved 100% Remedial Design, DNAPL recovery, with groundwater extraction to enhance hydraulic gradients, was initiated in one GRAA (GRAA 3) to evaluate effectiveness. Evaluation of data through September 1996 indicated that groundwater extraction (at a pumping rate of 0.3 gallons per minute [gpm] appeared to enhance DNAPL recovery in Wells RWS-1 and RWS-2. Based on this observation, DNAPL recovery with groundwater extraction was initiated in GRAAs 1 and 2 in October 1996. Beazer continues operation of the DNAPL Recovery System in the gradient enhanced mode.

August 5, 1997 - Beazer submitted a revised Groundwater Fate and Transport Evaluation Report (GFTER) to the USEPA for review and approval. The fate and transport modeling presented in the GFTER was completed by Beazer as a preliminary evaluation of whether natural attenuation processes are sufficient to meet the remedial objectives for shallow groundwater at the South Cavalcade Site. The results of the GFTER supported a preliminary hypothesis that effective natural attenuation of dissolved organic constituents of interest (COI) is occurring in the shallow groundwater zone at the Site. The GFTER was approved by the USEPA on August 14, 1997.

July 31, 2000 - Beazer submitted a study pursuant to the Work Plan for Verification of the Groundwater Fate and Transport Evaluation (VGFTER) which had been reviewed and approved by the USEPA. The Verification of the Groundwater Fate and Transport Evaluation Report (VGFTER) presented the results of a rigorous site investigation to further evaluate the MNA

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conclusions of the GFTR. The results of the VGFTER supported the conclusion of the GFTR modeling that an MNA remedy is feasible for dissolved phase COIs in shallow groundwater at the South Cavalcade Site. The EPA concluded its review of the VGFTER in July 2003. Subsequent to the VGFTER, Beazer and USEPA have completed thorough evaluations of historic site data and information to ensure that all Site source areas and potential preferential pathways have been identified and investigated.

March 1993 to present - In addition to the ongoing DNAPL recovery operation, Beazer has conducted annual groundwater monitoring in two deeper monitoring wells located in the vicinity of the Site, as stipulated in the RDWP. One well monitors the "200-Foot Sand" aquifer at a depth of approximately 220 feet below ground surface and the other well monitors a deeper sand unit at approximately 500-feet below ground surface. The results of this monitoring show that these groundwater-bearing units have not been impacted by site-related constituents.

3.3 CONCEPTUAL SITE MODEL

A detailed Site conceptual model was developed and presented in Section 2.0 of the GFTR. An overview of the Site conceptual model presented in the GFTR is presented in the following paragraphs, to facilitate an understanding of existing Site conditions pertinent to the supplemental groundwater characterization.

The COIs have been detected in groundwater within the shallow fluvial-deltaic deposits, comprising intermittent, interbedded fine sand, silt, and clay that extend from the ground surface to a maximum depth of approximately 22 ft-bgs and the underlying discontinuous sand unit (referred to as the intermediate zone in the 100% Remedial Design), which lies at a depth of 40 to 50 feet-bgs. The water table typically occurs within the shallow zone at a few feet below the ground surface. Groundwater flow within the shallow zone is generally in a westerly direction. Aquifer testing results indicate average horizontal hydraulic conductivities for the shallow zone for the northern and southern sections of the Site are 7.8×10^{-3} cm/sec (8,070 ft/year) and 1.6×10^{-3} cm/sec (1,655 ft/year), respectively. Horizontal hydraulic gradients in the shallow zone are relatively flat ranging from 1.76×10^{-3} to 5.88×10^{-3} ft/ft.

Groundwater flow within the intermediate zone appears to be also to the west, although hydraulic gradients have been noted to be relatively small and somewhat variable. Horizontal hydraulic conductivity values for the intermediate zone were determined through pumping tests performed during the remedial design. The average hydraulic conductivities, calculated using drawdown data from the piezometers monitored during the tests, for the intermediate zone in the northern and southern areas are 3.9×10^{-4} cm/s and 3.2×10^{-4} cm/s, respectively. The hydraulic connection between the intermediate and shallow zones appears to be negligible as indicated by the lack of drawdown in the shallow wells during these tests.

A downward vertical hydraulic gradient has been measured between the shallow aquifer and the intermediate zone. The potentiometric surface elevations for the intermediate zone are roughly 10 feet lower than the shallow zone water table elevations. The significant difference in

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potentiometric surface elevations is also consistent with limited hydraulic connectivity between the two zones.

The COIs have been identified to be Polynuclear Aromatic Hydrocarbon (PAH) compounds and benzene, toluene, ethylbenzene and xylene (BTEX) based on the analytical results of groundwater samples collected from within the shallow and intermediate zones. These constituents are typical COIs for sites where wood treating operations have been conducted using creosote as a preservative.

The source areas for these COIs are the locations at the Site where DNAPL has been observed as a separate phase in monitoring wells or visually observed during completion of soil borings. Figure 3-2 shows the inferred extent of DNAPL in the shallow and intermediate zones. No addition to, or movement of, DNAPL is anticipated over time, due to the strong indications that the DNAPL has achieved a static distribution within the subsurface and the fact that 44 years have elapsed since wood treating was conducted at this Site. However, the areas containing immobile free-phase or residual DNAPL are anticipated to be a long term source for dissolved phase COIs within shallow groundwater.

COIs dissolve from the DNAPL into the groundwater as a function of the effective solubilities. Migration of COIs occurs in the general groundwater flow direction due to dispersion and advection. Attenuation mechanisms such as dispersion, adsorption and biodegradation cause COI concentrations to decrease with migration away from the source. These factors combine to effectively limit the distance that dissolved COIs derived from a creosote source will migrate from the source area. A detailed evaluation of these natural attenuation processes has been conducted in the GFTER and VGFTER and is summarized in Section 3.4.

Consent agreements between EPA and the respective on-Site property owners prohibit use of the Site for residential purposes. The consent agreements between EPA and the respective property owners also prohibit on-Site groundwater use. The potential for Off-site use of groundwater in the shallow and intermediate zone is virtually non-existent for the following reasons:

- Water in the local area is supplied by the municipal system and evaluation done as part of the VGFTER showed that use of water from the municipal supply is more cost-effective than the installation and operation of a private well;
- The quality of shallow groundwater is poor due to naturally occurring conditions;
- Groundwater yield from the shallow and intermediate zones are expected to be low; and,
- The HCTRA plans to construct a highway along the western Site boundary and HCTRA has acquired several properties within this area for right-of-way purposes.

3.4 GFTER/VGFTER

The GFTER was initiated in response to a fundamental change in USEPA's approach to groundwater remediation at sites where it is impracticable to remediate Groundwater to Drinking Water Standards. These programmatic changes were outlined in a Memorandum dated July 31,

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1995 from USEPA Assistant Administrator Eliot Laws. In a subsequent letter to Beazer (USEPA, Oct. 6, 1995, Letter from Glenn Celerier to Michael Slenska, Beazer), USEPA indicated the following implications for the South Cavalcade Site: "There is some question as to whether EPA will continue to apply the current remedial action goals to groundwater cleanup. Therefore, should Beazer request, we will consider modifying the May 1995 Remedial Action Work Plan (RAWP) to delay groundwater extraction and treatment until further notice."

In response to this letter, as well as fundamental concerns regarding the practicability of the groundwater remedial action goals for the Site, Beazer with the approval of EPA, initiated the GFTER, to evaluate MNA as a possible alternative to the remedial alternative selected in the ROD. The overall objective of the GFTER and the subsequent VGFTER was to assess whether any realistic potential risk to human health and the environment exists currently, or in the future, with respect to reasonable potential exposure to dissolved constituents in shallow zone groundwater. The GFTER was conducted using available data to formulate lines of evidence for preliminary assessment of MNA feasibility. It involved predictive analytical fate and transport modeling to demonstrate an understanding of natural attenuation and its role in controlling COI migration. Rates of COI degradation were estimated with the model and extrapolation of these rates indicated that dissolved phase COI distributions were stable.

The GFTER provided a preliminary indication of MNA feasibility and the VGFTER was conducted to evaluate more lines of MNA evidence. The VGFTER Work Plan was reviewed and approved by USEPA, and the field program was implemented in November/December 1999, with supplemental work completed in April and June 2000. The primary and secondary lines of MNA evidence that were evaluated in the VGFTER were supported by the following sampling and information gathering activities:

- Sampling to verify the parameter values used in the GFTER analytical modeling;
- Monitoring of hydraulic gradients and groundwater flow directions;
- Sampling to characterize organic carbon concentrations in the aquifer matrix to evaluate COI sorption;
- Evaluation of the physical properties of the aquifer matrix;
- Evaluation of DNAPL physical and chemical properties;
- Assessment of the potential for future groundwater use in the vicinity of the site;
- Sampling to define the plume core and central axis;
- Sampling to characterize electron acceptors and metabolic by-products;
- Sampling to characterize microbial capabilities regarding COI biodegradation; and,
- Sampling to characterize total organic carbon in groundwater, to evaluate for the accumulation of COI daughter product.

A summary of the key conclusions from the VGFTER were as follows:

- The model parameters used in the GFTER were adequately representative of Site conditions;

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- Monitor well locations used to assess the GFTER modeling were representative of conditions within the plume core and therefore were appropriate for MNA evaluation;
- COI concentrations at downgradient locations were consistent with GFTER predictions and therefore were supportive of MNA feasibility;
- No other significant dissolved plumes exist on the Site. Therefore the dissolved COI distributions that were the focus of the MNA evaluation were the most extensive
- Natural attenuation is occurring at the site and an MNA remedy is feasible and appropriate.

The evaluation of primary and secondary lines of MNA evidence in the GFTER and VGFTER led to the overall conclusion that exposure potential to dissolved phase COIs in shallow groundwater was negligible. Accordingly, Beazer recommended in the VGFTER that an MNA monitoring program should be developed and implemented.

3.5 DNAPL RECOVERY

As mentioned in Section 3.2, Beazer continues to operate four DNAPL recovery wells on the Site (RWS-1, RWS-2, RWN-4, and RWS-5) at the locations shown on Figure 3-2. DNAPL recovery is enhanced by groundwater pumping. The cumulative DNAPL recovery record for these wells is shown in Figures 3-3 through 3-6, and the total recovery record for the Site is shown in Figure 3-7. A summary of DNAPL and groundwater recovery as of December 2005 is provided below.

DNAPL Recovery Well	Total DNAPL Recovered (gal)	% DNAPL Recovered	Groundwater pumping rate (gpm)
RWS-1	1742	44.8	0.3
RWS-2	335	8.6	0.3
RWS-5	87	2.2	1
RWN-4	1722	44.3	0.3
TOTAL	3886	100	1.9

Figure 3-7 shows that the rate of total DNAPL recovery over time is decreasing. The maximum recovery rate was approximately 1.92 gpd, and it occurred in 1998 and 1999. Subsequently, the rate decreased to approximately 1.05 gpd, and the average rate in recent years was approximately 0.84 gpd.

These trends indicate that the overall rate of DNAPL recovery is decreasing and, therefore, that the effort per unit volume of DNAPL recovered is increasing. On this basis, Beazer considers that there is minimal benefit in continuing the DNAPL recovery operation. It is also noted that DNAPL recovery has little benefit in terms of dissolved phase migration, because a residual DNAPL component is retained in the formation and will continue as an ongoing source for an indefinite period. The various fate and transport studies conducted at the Site indicate that the

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potential for exposure to the dissolved phase plume is negligible, regardless of DNAPL recovery efforts.

A further consideration for discontinuing DNAPL recovery is the potential effect of discontinuing groundwater pumping. As noted above, DNAPL recovery is enhanced by a relatively low pumping rate of 1.9 gpm distributed across the four widely-spaced DNAPL recovery wells at the Site. The discontinuation of this groundwater recovery component is expected have a minimal effect on dissolved phase migration, for the following reasons:

- The total pumping rate is relatively small and is applied over a large area.
- The downgradient areas of the dissolved phase source zones are not hydraulically affected by the wells. Consequently, the migration of dissolved phase COIs away from these source zone areas will be similar, with or without groundwater recovery.
- The groundwater flow rates at the Site are relatively low, particularly in the south end of the Site. For example, with the hydraulic gradient and conductivity values used in the GFTER, the ambient groundwater flow rate in the south end is estimated to range between 1.7 and 14 ft/yr. At this low rate, it is noted that the existing extent of the dissolved phase plume has not been significantly influenced by groundwater pumping. The current extent is more indicative of pre-pumping conditions since the plume front would have migrated away from the source several years ago.

In summary, Beazer considers that the DNAPL recovery operation produces negligible environmental benefit and therefore should be discontinued. The effect of discontinuing the DNAPL and associated groundwater recovery operations is expected to be insignificant with regard to migration, extent and exposure potential for dissolved phase COIs in groundwater.

SECTION 4.0

4.0 SCOPE OF WORK AND FIELD METHODS

4.1 SOIL BORINGS

Six soil borings were completed into the shallow zone and ten into the intermediate zone as shown on Figure 4-1. Soil borings were advanced into the subsurface using direct push techniques (e.g., Geoprobe®) by Advanced Drilling Systems, a licensed driller in the state of Texas. A continuous soil core was collected from all of the borings. The soil was classified by the field geologist according to the Unified Soil Classification System (USCS) and observations were made of NAPL presence, odor, color, and qualitative degree of saturation. Draft logs were reviewed daily to allow for real-time evaluation of the need for step-out boring locations. Soil boring logs are provided in Appendix A.

Each soil core was scanned along its length with the Photoionization Detector (PID) to identify the occurrence of volatile organic compounds (VOCs). One soil sample of relatively coarse-grained strata was collected from each intermediate zone boring, for analysis of Total Organic Carbon (TOC) content via the Walkley-Black Method. Following the completion of each soil boring, all downhole equipment was thoroughly cleaned by washing all surfaces with an Alconox® (or equivalent) solution and rinsing with potable water.

4.2 TEMPORARY WELL INSTALLATION

Temporary monitoring wells were installed in each of the soil borings (6 shallow and 10 intermediate) and construction details are summarized in Table 4-1. The wells were installed by placing one inch PVC casing and screen into the steel casing used for the direct push boreholes. The steel casing was then extracted, allowing the formation to collapse around the PVC well. The shallow wells were installed at depths ranging from 20 to 24 feet below ground surface (bgs) and set with their base at least six-inches below the interface between the shallow zone and the underlying clay. Screens were set to span the total thickness of the shallow zone sand, and varied from five to 15 feet in length.

The intermediate zone wells were installed at depths ranging from 48 to 64 feet (bgs). Well screens were set to span the total thickness of sandy intervals encountered in the intermediate zone, and ranged from five to 15 feet in length. Before installation of the intermediate zone wells, three inch PVC casing was installed and grouted into the clay layer underlying the shallow zone, to prevent cross contamination between the shallow zone and intermediate zone.

4.3 SITE WIDE GROUNDWATER MEASUREMENTS

Before sampling of existing wells, groundwater levels and apparent DNAPL thickness (if present) was measured using an electronic oil/water interface probe. Measurements were made at a precision of 0.01 foot. These data are summarized on Table 4-2.

4.4 GROUNDWATER SAMPLE COLLECTION AND ANALYSIS

Groundwater samples were collected at each of the 16 temporary well locations (Figure 4-1) and 21 existing monitoring well or piezometer locations. Figures 4-2 and 4-3, respectively, show the locations of the existing shallow and intermediate zone monitoring wells and piezometers that were sampled. The Work Plan also included sampling of six additional existing wells, but these wells could not be sampled for the following reasons: 1) Wells MW-08, MW-09, MW-24, and MW-16 could not be located for various reasons, 2) Well MW-11 was damaged, and 3) Well MW-12R contained DNAPL.

The temporary wells were sampled using low flow micro-purging techniques and the following decision framework:

- A peristaltic pump was the preferred equipment for well purging and sample collection;
- If water level in the well dropped too low to use a peristaltic pump, then a bladder pump was used;
- If the water was too turbid to handle with a bladder pump, then a disposable bailer was used; and,
- If the well went dry during purging, it was allowed to recover and the sample was collected as soon as possible.

Groundwater samples were not collected from existing monitoring wells where DNAPL was detected. Of the wells schedule for sampling, only Well MW-12 contained a measurable thickness of DNAPL. Groundwater purging and sampling of existing wells was conducted using low flow methods, as described above.

Field parameters including temperature, pH, conductivity, turbidity, dissolved oxygen (DO), and oxidation-reduction potential (ORP) were recorded at regular intervals during purging. These data are included on the Groundwater Sample Collection Record Forms included as Appendix B and in Table 4-4. Purge water was discharged into a bucket and was visually inspected for indications of hydrocarbon sheen. Groundwater samples were collected directly into pre-preserved, laboratory supplied containers, and placed immediately on ice.

The coolers were prepared with sufficient packing material to protect the sample jars and bottles during shipment. Samples were shipped via Fed Ex to Severn Trent Laboratory (STL) Pittsburgh, Pennsylvania for analysis. A chain-of-custody (COC) form was completed by a KEY representative and accompanied the samples to the analytical laboratory (Appendix C). The samples were analyzed for benzene and naphthalene using USEPA SW-846 Method 8260B.

All non-dedicated downhole equipment (i.e. pumps, cable, and oil-water interface indicator) were decontaminated between sample locations by washing with Alconox[®] (or equivalent) solution, followed by a deionized water rinse. All purge water was discharged to the on-site water treatment facility.

4.5 SURVEY

Each temporary well location was surveyed relative to the Texas Coordinate System, South Central Zone, and the 1973 United States Coastal and Geodetic Survey adjustment of the 1929 mean sea level datum. The survey was conducted by Clark-Romero Corp, a licensed Texas surveyor. Survey data are provided in Table 4-3.

4.6 DECOMMISSIONING OF THE TEMPORARY WELLS

The temporary monitoring wells were decommissioned in accordance with *Administrative Rules of the Texas Department of Licensing and Regulation 16 Texas Administrative Code, Chapter 76.1004: Technical Requirements – Standards for Capping and Plugging of Wells and Plugging Wells that Penetrate Undesirable Water or Constituent Zones.*

The decommissioning procedure for the intermediate zone wells was as follows:

- The well screen and riser were removed from the borehole;
- The open borehole was grouted up to the bottom of the temporary casing, with a cement-bentonite mixture;
- The temporary casing was removed and the open borehole was grouted to the ground surface; and,
- Each location was restored with concrete, to original grade.

Temporary shallow zone monitoring wells were decommissioned as follows:

- The well screen and riser were completely removed from the borehole;
- The boreholes were sealed to the ground surface with a cement-bentonite grout; and,
- Each location was restored with concrete, to original grade.

4.7 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) included soil cuttings, purged groundwater, decontamination fluids, disposable sampling materials, and personal protective equipment (PPE). All liquid IDW was discharged to the on-Site groundwater treatment system. All solid IDW was contained in labeled, steel 55-gallon drums which was subsequently disposed off-site at a permitted facility. Sample tubing and PPE (gloves, etc.) from the investigation were placed in bags, tied up, and stored at the Site. PVC well material was cut in 3-5 foot lengths, placed in bags, and disposed off-site at a permitted facility.

SECTION 5.0

5.0 RESULTS

5.1 SITE GEOLOGY

Geologic information from the current program was used in conjunction with previous information to develop the geologic cross sections shown in Figures 5-1, 5-2, and 5-3. The geologic information acquired through the field investigation is consistent with the previous understanding of Site geology.

5.2 GROUNDWATER FLOW

Figures 5-4 and 5-5 present groundwater potentiometric contours for the shallow and intermediate zones, respectively, based on measurements from September 16-17, 2005. Groundwater flow direction in the shallow zone was consistent with previous work, and is generally from east to west. Groundwater flow direction in the intermediate zone is also generally to the west, but the flow field is more convoluted than the shallow zone, probably due to the discontinuous nature of the intermediate zone sand layers.

5.3 TOTAL ORGANIC CARBON IN INTERMEDIATE ZONE AQUIFER MATRIX

Soil samples were collected from sandy horizons at 10 locations within the intermediate zone. Analysis was conducted for Total Organic Carbon (TOC) by the Walkley-Black Method to evaluate the sorptive capacity of the material. The results are shown in Table 5-1 and indicate that TOC was not detected in the intermediate zone samples. This result is considered suspect, because experience has shown that while the TOC of sandy material is typically low, it is almost always detectable. These samples were not re-run due to the absence of significant dissolved phase concentrations in intermediate zone groundwater samples.

5.4 GROUNDWATER QUALITY

A total of 16 temporary wells and 21 existing wells were sampled from September 14-20, 2005. Samples were analyzed for benzene and naphthalene by USEPA Method 8260B. Analytical data are provided in Table 5-2.

Shallow Zone

Groundwater results for the shallow zone are shown on Figure 3-7. Results from temporary shallow zone wells were all below the ROD remedial goal of 5 ug/l for benzene and a tap-water based screening criterion of 6.2 ug/l for naphthalene (It must be noted that the naphthalene screening level is only referenced herein to facilitate the discussion on groundwater analytical results. It should not be construed that this criterion is an enforceable standard or otherwise applicable to this site). Some of the groundwater results from existing shallow monitoring wells exceeded the naphthalene screening level only. The greater concentrations of constituents were all detected in the immediate vicinity of the previously identified shallow source zone locations, as shown on Figure 5-6.

These results are consistent with natural attenuation of site constituents within a relatively short migration distance away from the source zone. They provide delineation of the extent of impact to the southwest of the Site and they indicate the absence of significant constituent migration along the potential shallow zone migration pathways targeted in this investigation. Where existing wells had been sampled previously, the current results are consistent with previous data.

Intermediate Zone

Groundwater results from the intermediate zone are shown on Figure 5-7. Results from temporary intermediate zone wells were all below the ROD remedial goal of 5 ug/l for benzene and the tap-water based screening criterion of 6.2 ug/l for naphthalene. Six of the seven permanent intermediate zone monitoring wells exceeded the naphthalene screening criterion and one exceeded the remedial goal for benzene.

Similar to the shallow zone samples, the greater concentrations of constituents were all detected in the immediate vicinity of the previously identified intermediate zone source zone locations, as shown on Figure 5-7. These results are consistent with natural attenuation within a relatively short migration distance from the source zones. They also indicate the absence of significant constituent migration along the potential intermediate zone migration pathways targeted in this investigation. Where existing wells had been sampled previously, the current results are consistent with previous data.

SECTION 6.0

6.0 CONCLUSIONS/RECOMMENDATIONS

The results from the Supplemental Groundwater Characterization are summarized according to the specific project objectives presented in Section 2.0.

Investigate Potential Preferential Pathways -- Benzene concentrations were less than the ROD remedial goal and naphthalene concentrations were less than a tap-water based screening criterion in all temporary well groundwater samples. These results conclusively indicate that significant constituent migration is not occurring within the targeted potential migration pathways in the shallow zone and the intermediate zone.

Delineate Shallow Groundwater Impacts to the Southwest of the Site -- Benzene concentrations were less than the ROD remedial goal and naphthalene concentrations were less than a tap-water based screening criterion in all temporary well groundwater samples collected in the area to the southwest of the Site. The goal of completing delineation in this area has therefore been accomplished.

Provide Additional Data for Design of MNA Program - The additional data acquired through this investigation will greatly aid the development of an effective MNA program. The results confirm that the dissolved phase COI distributions are limited to within a relatively short distance of the source areas. The data have also increased the precision to which the source areas and dissolved plumes are delineated.

The results of this Supplemental Groundwater Characterization support the earlier recommendation in the VGFTER for the incorporation of a MNA component into the groundwater remedy for the Site. Therefore, Beazer recommends that a MNA groundwater monitoring program be developed and implemented for the Site. From an administrative perspective, EPA will need to determine whether an amendment to the ROD is necessary to formally change the groundwater remedy and groundwater remedial goals

SECTION 7.0

7.0 REFERENCES

Administrative Rules of the Texas Department of Licensing and Regulation 16 Texas Administrative Code, Chapter 76:1004: Technical Requirements – Standards for Capping and Plugging of Wells and Plugging Wells that Penetrate Undesirable Water or Constituent Zones

Bechtel Environmental, Inc., May 1990. *Detailed Statement of Work for South Cavalcade Site, Houston, Texas.*

Key Environmental Inc., August 1997, Groundwater Fate and Transport Evaluation, South Cavalcade Superfund Site, Houston, Texas

Key Environmental Inc., July 31, 2000, Verification of Groundwater Fate and Transport Evaluation, South Cavalcade Superfund Site, Houston, Texas

Key Environmental Inc. August 2005, Supplemental Groundwater Characterization Work plan, South Cavalcade Superfund Site, Houston, Texas

Keystone Environmental Resources, Inc., July 1988. *Final Report - Remedial Investigation, South Cavalcade Site, Houston, Texas.*

Keystone Environmental Resources, Inc., August 1988. *Feasibility Study , South Cavalcade Site, Houston, Texas.*

U.S. EPA, 1988 Record of Decision (ROD) for South Cavalcade Site

TABLES

TABLE 4-1
TEMPORARY WELL CONSTRUCTION DETAILS
SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

Boring Location	Drilling Complete Date	Total Depth (ft-bgs)	Sand/Silt - Intervals (ft-bgs)	Clay Intervals (ft-bgs)	Depth to Saturation (ft-bgs)	Temp Monitoring Well- Screen Interv. (ft-bgs)	NAPL Product/Sheen/Odor - and Interval	Sample Results ug/l	COMMENTS* Field Observations
TW-5-1	9/12/2005	20	5-18.9	18.9-25	8	5-15	NONE	Benzene - <0.13 Naphthalene - <0.26	
TW-6-2	9/15/2005	20	10-17	2-10 17-20	7.8	7.75-17.75	NONE	Benzene - <0.13 Naphthalene - 0.54 J	
TW-9-1	9/14/2005	25	23-25	18-23	11.8	9-24	NONE	Benzene - <0.13 Naphthalene - <0.26	
TW-9-2	9/13/2005	20	15-16	2-15 16-20	15	13.5-18.5	NONE	Benzene - <0.13 Naphthalene - <0.26	Pumped dry on 9/14/05
TW-10-2	9/12/2005	20	2-5	5-20	15	10-20	NONE	Benzene - <0.13 Naphthalene - <0.26	
TW-11-1	9/14/2005	25	11-12.75 14-22.25	12.75-14 22.25-25	7.2	12.2-22.2	NONE	Benzene - <0.13 Naphthalene - 5.6	
TW-1-1	9/15/2005	55	1.5-19.6 29.8-30 38-40	19.6-38 40-55	12	29-44	NONE	Benzene - 0.19 J Naphthalene - <0.26	Set 3" Casing to 25' on 9/13/05 Pumped dry on 9/17/05
TW-2-1	9/16/2005	50	8-23 42-45	3-8 23-42 44.5-50	8	38.8-43.8	NONE	Benzene - 0.34 J Naphthalene - <0.26	Set 3" Casing to 25' on 9/15/05
TW-3-1	9/14/2005	65	0.5-24 49-63.5	24-49 63.5-65	10	49-64	NONE	Benzene - 0.16 J Naphthalene - <0.26	Set 3" Casing to 25' on 9/12/05
TW-3-2	9/14/2005	60	1-8.2 10-24.5 45-58.5	24.5-45 58.5-60	7	44-59	NONE	Benzene - <0.13 Naphthalene - <0.26	Set 3" Casing to 25' on 9/12/05
TW-4-1	9/16/2005	55	0-5 10.5-14 41-54	5-10.5 14-41 54-55	10.5	40-55	NONE	Benzene - <0.13 Naphthalene - <0.26	Set 3" Casing to 25' on 9/15/05
TW-4-2	9/16/2005	55	0-6.5 11-19 45-54	6.5-11 19-45 54-55	11	45-55	NONE	Benzene - <0.13 Naphthalene - <0.26	Set 3" Casing to 25' on 9/15/05 Pumped dry on 9/18/05
TW-6-1	9/17/2005	58	10-17 53.8-57	2-10 17-53 57-58	7.8	52.75-57.75	NONE	Benzene - <0.13 Naphthalene - <0.26	Set 3" Casing to 25' on 9/15/05
TW-7-1	9/16/2005	50	13-17.5 39.75-48	2.5-13 19.75-39.75 48-50	17.5	38-48	NONE	Benzene - <0.13 Naphthalene - <0.26	Set 3" Casing to 25' on 9/15/05
TW-8-1	9/14/2005	52	10-14 15-20 40-52	20-34 38-40	34	32-52	NONE	Benzene - <0.13 Naphthalene - <0.26	Set 3" Casing to 25' on 9/12/05
TW-10-1	9/13/2005	55	47-54	21.5-47	54	44-55	NONE	Benzene - 0.13 J Naphthalene - <0.26	Set 3" Casing on 9/12/05

Notes:
J = Estimated Concentration
ft-bgs = Feet Below Ground Surface

TABLE 4-2
DEPTH TO GROUNDWATER
AND APPARENT DNAPL THICKNESS MEASUREMENTS
SEPTEMBER 2005
SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

Piezometer/ Monitoring Well	ZONE	Date	Time	Measuring Point Elevation (ft-msl)	Depth to Water (ft-toc)	Total Depth (ft-toc)	Apparent DNAPL Thickness (feet)	Groundwater Potentiometric Surface Elevation (ft-msl)
MW-01	shallow	9/16/2005	1323	54.11	10.79	16.30	0	43.32
MW-02	shallow	9/17/2005	0910	53.79	9.65	23.70	0	44.14
MW-03	shallow	9/16/2005	0942	52.04	7.41	27.64	0	44.63
MW-04	shallow	9/16/2005	1050	49.71	4.43	24.87	Trace on probe	45.28
MW-05	shallow	9/16/2005	0912	53.55	11.16	24.28	0	42.39
MW-06	shallow	9/17/2005	0739	48.83	5.09	23.15	0	43.74
MW-07	shallow	9/16/2005	0950	52.89	7.67	30.73	0	45.22
MW-08	shallow	9/16/2005		48.79	Unable to locate			-
MW-09	shallow	9/16/2005			Unable to locate: Paved over			-
MW-24	shallow	9/17/2005		51.99	Unable to locate			-
MW-25	shallow	9/16/2005	0926	51.72	10.22	18.01	0	41.50
MW-26	shallow	9/16/2005	0755	48.35	7.84	18.76	0	40.51
OW-01	shallow	9/17/2005	0940	52.37	5.39	17.09	0	46.98
OW-02	shallow	9/17/2005	0854	53.89	9.54	17.31	0	44.35
OW-07	shallow	9/16/2005	1243	54.64	10.57	19.49	0	44.07
OW-08	shallow	9/16/2005	1450	50.99	9.49	16.60	0	41.50
OW-09	shallow	9/17/2005	0733	52.56	8.40	16.92	0	44.16
OW-10	shallow	9/16/2005	0805	50.84	9.10	24.72	0	41.84
OW-11	shallow	9/17/2005	0751	51.75	6.10	21.30	0	45.65
OW-14	shallow	9/16/2005	1226	51.51	6.24	18.87	0	45.27
OW-17	shallow	9/16/2005	1009	Not Surveyed	6.81	24.42	sheen	-
P-02N	shallow	9/17/2005	0847	Not Surveyed	9.82	27.20	0.80	-
PZN-10	shallow	9/17/2005	0833	51.03	7.85	20.16	0	43.18
PZN-11	shallow	9/17/2005	0828	51.11	7.96	20.15	0	43.15
PZN-20	shallow	9/17/2005	0918	51.28	7.67	20.11	0	43.61
PZN-21	shallow	9/17/2005	0920	50.87	7.05	20.14	0	43.82
PZN-30	shallow	9/16/2005	1336	50.79	7.23	10.22	0	43.56
PZN-31	shallow	9/17/2005	1800	50.75	7.20	19.45	0	43.55
PZN-40	shallow	9/17/2005	0856	50.91	6.56	20.17	0	44.35
PZN-41	shallow	9/17/2005	0927	50.75	6.41	20.60	0	44.34
PZN-50	shallow	9/16/2005	1344	50.85	6.74	20.19	0	44.11
PZN-51	shallow	9/17/2005	0912	52.76	6.90	20.17	0	45.86
PZS-10	shallow	9/17/2005	0833	48.09	8.14	14.86	0	39.95
PZS-11	shallow	9/17/2005	0828	48.28	7.43	20.22	0	40.85
PZS-20	shallow	9/16/2005	1014	48.64	5.69	23.78	2.30	42.95
PZS-21	shallow	9/16/2005	1017	48.57	5.47	21.59	0	43.10
PZS-30	shallow	9/16/2005	1018	49.39	5.37	20.36	0	44.02
PZS-31	shallow	9/16/2005	1023	49.27	5.36	20.16	0	43.91
PZS-40	shallow	9/16/2005	1032	49.64	4.87	20.14	0	44.77
PZS-41	shallow	9/16/2005	1038	49.55	4.83	20.09	0	44.72
PZS-50	shallow	9/17/2005	0754	49.85	6.34	21.70	0.30	43.51
PZS-51	shallow			49.71	Unable to locate. Well possibly under Jersey Barrier			
PZS-60	shallow	9/17/2005	0806	51.64	5.92	19.60	0	45.72
PZS-61	shallow	9/17/2005	0801	51.57	5.62	20.11	0	45.95
MW-10	intermediate	9/16/2005	1525	53.67	21.14	47.43	0	32.53
MW-11	intermediate	9/16/2005		52.49	Damaged. Well at an extreme angle. Unable to measure.			-
MW-12R	intermediate	9/17/2005	0844	53.87	20.49	55.17	2.00	33.38
MW-14R	intermediate	9/17/2005	0718	48.97	16.03	46.05	0	32.94
MW-16	intermediate	9/16/2005			Unable to locate: Paved over			-
MW-23	intermediate	9/16/2005			Unable to locate			-
OW-13	NA	9/16/2005		51.63	Unable to locate			-
OW-15	intermediate	9/17/2005	0900	Not Surveyed	20.59	53.00	0	-
OW-16	intermediate	9/17/2005	0903	Not Surveyed	20.75	53.69	0	-
OW-19	NA	9/16/2005		Not Surveyed	Damaged			-
OW-20	intermediate	9/16/2005	1012	Not Surveyed	13.83	50.04	1.27	-
P-01	intermediate	9/16/2005	1453	52.96	19.41	49.49	0	33.55
P-02R	intermediate	9/16/2005	0958	49.05	15.56	49.52	0	33.49
P-03R	intermediate	9/17/2005	0742	50.14	28.30	64.84	0	21.84
P-04	intermediate	9/16/2005	1238	51.91	20.32	53.74	0	31.59
P-05	intermediate	9/17/2005	0937	52.19	9.35	50.71	0	42.84
ITW-02	intermediate	9/17/2005	0851	Not Surveyed	20.92	59.25	2.40	-

TABLE 4-3
SUMMARY OF SITE SURVEY INFORMATION
SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SEPTEMBER 2005
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

Location	Grid Northing ⁽¹⁾	Grid Easting ⁽¹⁾	Ground Elevation ⁽²⁾ (ft. msl)
TW-1-1	734211.33	3157466.56	52.21
TW-2-1	733521.75	3157366.75	50.61
TW-3-1	733013.9	3158212.2	50.04
TW-3-2	733321.13	3158246.67	50.58
TW-4-1	732717.5	3157610.61	50.18
TW-4-2	732903.29	3157537.55	50.14
TW-5-1	733131.46	3157501.92	50.33
TW-6-1	731884.23	3157888.97	49.48
TW-6-2	731877.92	3157889.27	49.49
TW-7-1	731470.35	3157931.14	49.03
TW-8-1	731220.49	3157323.21	48.90
TW-9-1	730601.31	3157309.12	47.68
TW-9-2	730882.55	3157295.93	48.50
TW-10-1	730290.40	3157325.30	46.87
TW-10-2	730289.91	3157320.43	46.85
TW-11-1	730370.77	3157900.81	48.25

Notes:

ft-msl = Feet Mean Sea Level

1. Texas South - Central State Plane Coordinate System Referenced to the North American Datum of 1973 and in units of feet.
2. National Geodetic Vertical Datum of 1929 in units of feet.

TABLE 4-4
FIELD PARAMETER DATA
SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

<i>Sample Location</i>	<i>Zone</i>	<i>Temperature (° C)</i>	<i>pH (S.U.)</i>	<i>Specific Conductivity (mS/m)</i>	<i>ORP (mV)</i>	<i>Turbidity (NTU)</i>	<i>D.O. (mg/L)</i>
TW-5-1	Shallow	25.2	10.00	54.4	-306	>999	0.00
TW-6-2	Shallow	30.0	7.92	64	-30	>999	0.00
TW-9-1	Shallow	28.6	9.13	1	-178	>999	0.09
TW-9-2	Shallow	27.8	9.96	159	-71	>287	6.55
TW-10-2	Shallow	28.7	7.21	77.5	-78	>999	3.43
TW-11-1	Shallow	31.3	10.98	109	-496	>999	0.00
MW-01	Shallow	26.8	7.76	87.4	-131	0	3.01
MW-05	Shallow	25.1	7.64	76.8	4	0	0.00
MW-25	Shallow	30.5	7.11	75.6	-56	0	0.00
MW-26	Shallow	28.8	7.45	0.112	-200	0	0.00
OW-01	Shallow	24.3	10.52	51.1	-333	0	0.00
OW-08	Shallow	26.5	7.33	60.1	20	41.6	0.00
OW-09	Shallow	25.4	7.51	113	-37	0	0.00
PZN-20	Shallow	25.5	7.61	71.9	-175	0	0.00
PZN-30	Shallow	25.4	7.66	63.9	-166	0	0.00
PZN-50	Shallow	25.4	8.33	106	-202	0	0.00
PZS-30	Shallow	28.4	7.76	54.1	-250	0	0.00
PZS-40	Shallow	27.8	8.51	42.6	-191	0	0.00
PZS-60	Shallow	28.5	7.40	131	-156	39.9	0.00
TW-1-1	Intermediate	29.0	7.17	170	-1000	450	0.00
TW-2-1	Intermediate	37.9	7.30	140	-71.1	>999	0.17
TW-3-1	Intermediate	37.6	9.91	85.1	-110	>999	0.21
TW-3-2	Intermediate	33.1	9.28	91	-211	>999	0.54
TW-4-1	Intermediate	23.0	7.80	108	-105	172	1.11
TW-4-2	Intermediate	23.3	7.18	130	-164	>999	1.71
TW-6-1	Intermediate	29.1	8.63	64	-200	>999	0.31
TW-7-1	Intermediate	28.7	7.76	1.02	-85	328	2.04
TW-8-1	Intermediate	26.0	8.99	92	-487	>999	0.00
TW-10-1	Intermediate	30.0	9.41	108	-225	>999	1.11
MW-10	Intermediate	24.4	7.49	129	-170	8	0.00
MW-14R	Intermediate	26.4	7.71	0.118	-111	11.2	0.00
P-03R	Intermediate	25.1	11.63	167	-32	48	8.01
P-01	Intermediate	26.5	7.84	90.2	37	27.8	0.00
P-02R	Intermediate	27.0	7.20	129	-175	0	0.00
P-04	Intermediate	26.1	7.78	107	-62	15.9	0.00
P-05	Intermediate	26.7	12.27	419	-166	69.7	2.20

Notes:

°C - Degrees Celsius

S. U. - Standard Units

mS/m - milliSiemens per meter

mV - milliVolts

NTU - Nephelometric Turbidity Unit

mg/L - milligram per liter

TABLE 5-1
SUMMARY OF SOIL ANALYTICAL RESULTS
SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

Sample Location	Zone	Sample Date	Starting Depth (ft-bgs)	Ending Depth (ft-bgs)	TOC (mg/kg)
TW-1-1	Intermediate	9/15/2005	38.0	40.0	< 54.0
TW-2-1	Intermediate	9/16/2005	42.0	44.0	< 51.9
TW-3-1	Intermediate	9/14/2005	63.0	64.0	< 54.7
TW-3-2	Intermediate	9/14/2005	57.0	58.0	< 54.2
TW-4-1	Intermediate	9/16/2005	51.0	53.0	< 57.4
TW-4-2	Intermediate	9/16/2005	52.0	53.0	< 55.5
TW-6-1	Intermediate	9/17/2005	55.0	56.0	< 56.9
TW-7-1	Intermediate	9/16/2005	42.0	43.0	< 57.1
TW-8-1	Intermediate	9/14/2005	41.0	43.0	< 53.9

Notes:

ft-bgs - Feet below ground surface

mg/kg - milligrams per kilogram

TABLE 5-2
GROUNDWATER ANALYTICAL RESULTS
SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

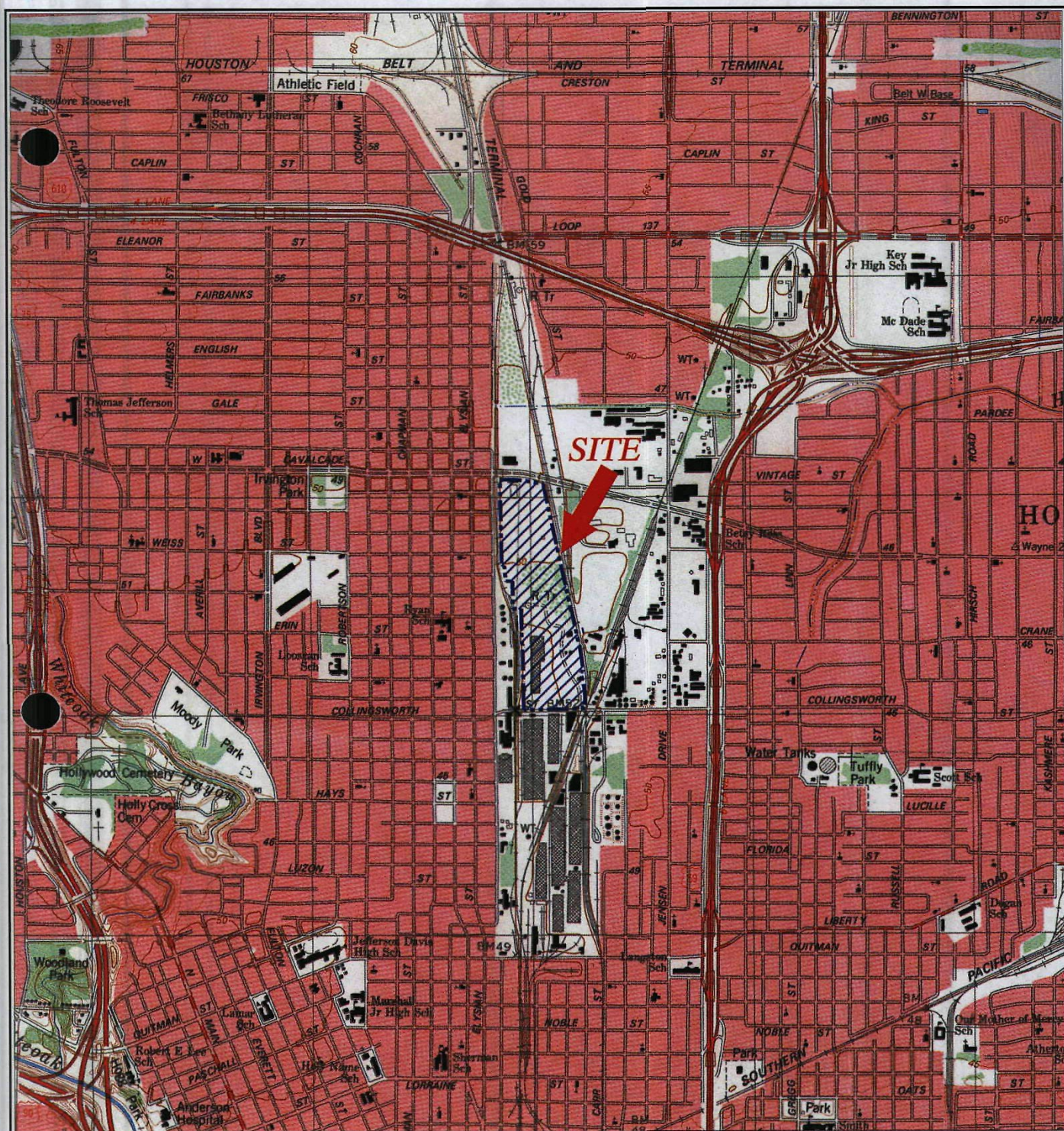
Sample Location	Zone	Sample Date	Benzene (ug/l)	Naphthalene (ug/l)
TW-5-1	Shallow	9/14/2005	<0.13	<0.26
TW-6-2	Shallow	9/18/2005	<0.13	0.54 J
TW-9-1	Shallow	9/14/2005	<0.13	<0.26
TW-9-2	Shallow	9/15/2005	<0.13	<0.26
TW-10-2	Shallow	9/14/2005	<0.13	<0.26
TW-11-1	Shallow	9/15/2005	<0.13	5.60
MW-01	Shallow	9/17/2005	<13	2100
MW-05	Shallow	9/19/2005	<0.13	<0.26
MW-25	Shallow	9/19/2005	<0.13	<0.26
MW-26	Shallow	9/19/2005	<13	1700
OW-01	Shallow	9/20/2005	<0.13	2.7
OW-08	Shallow	9/18/2005	<0.13	<0.26
OW-09	Shallow	9/20/2005	<0.13	<0.26
PZN-20	Shallow	9/17/2005	<25	3900
PZN-30	Shallow	9/17/2005	<0.13	<0.26
PZN-50	Shallow	9/17/2005	<50	8600
PZS-30	Shallow	9/19/2005	<25	3400
PZS-40	Shallow	9/17/2005	<0.63	89
PZS-60	Shallow	9/18/2005	1.7	11
TW-1-1	Intermediate	9/18/2005	0.19 J	<0.26
TW-2-1	Intermediate	9/17/2005	0.34 J	<0.26
TW-3-1	Intermediate	9/17/2005	0.16 J	<0.26
TW-3-2	Intermediate	9/15/2005	<0.13	<0.26
TW-4-1	Intermediate	9/18/2005	<0.13	<0.26
TW-4-2	Intermediate	9/19/2005	<0.13	<0.26
TW-6-1	Intermediate	9/18/2005	<0.13	<0.26
TW-7-1	Intermediate	9/18/2005	<0.13	<0.26
TW-8-1	Intermediate	9/15/2005	<0.13	<0.26
TW-10-1	Intermediate	9/17/2005	0.13 J	<0.26
MW-10	Intermediate	9/18/2005	<1.3	150
MW-14R	Intermediate	9/19/2005	170 J	11000
P-01	Intermediate	9/18/2005	<0.13	<0.26
P-02R	Intermediate	9/19/2005	<31	4200
P-03R	Intermediate	9/20/2005	<1.3	230
P-04	Intermediate	9/18/2005	<0.13	2.3
P-05	Intermediate	9/20/2005	3.1	320

Notes:

ug/L - micrograms per liter

J - Estimated Value

FIGURES



QUADRANGLE LOCATION

REFERENCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE
OF SETTEGAST, TEXAS - 1982

ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRAWN: BKC DATE: 3/1/06
CHKD: RMB DATE: 3/1/06
APPD: JSZ DATE: 3/1/06
SCALE: 1" = 2000'

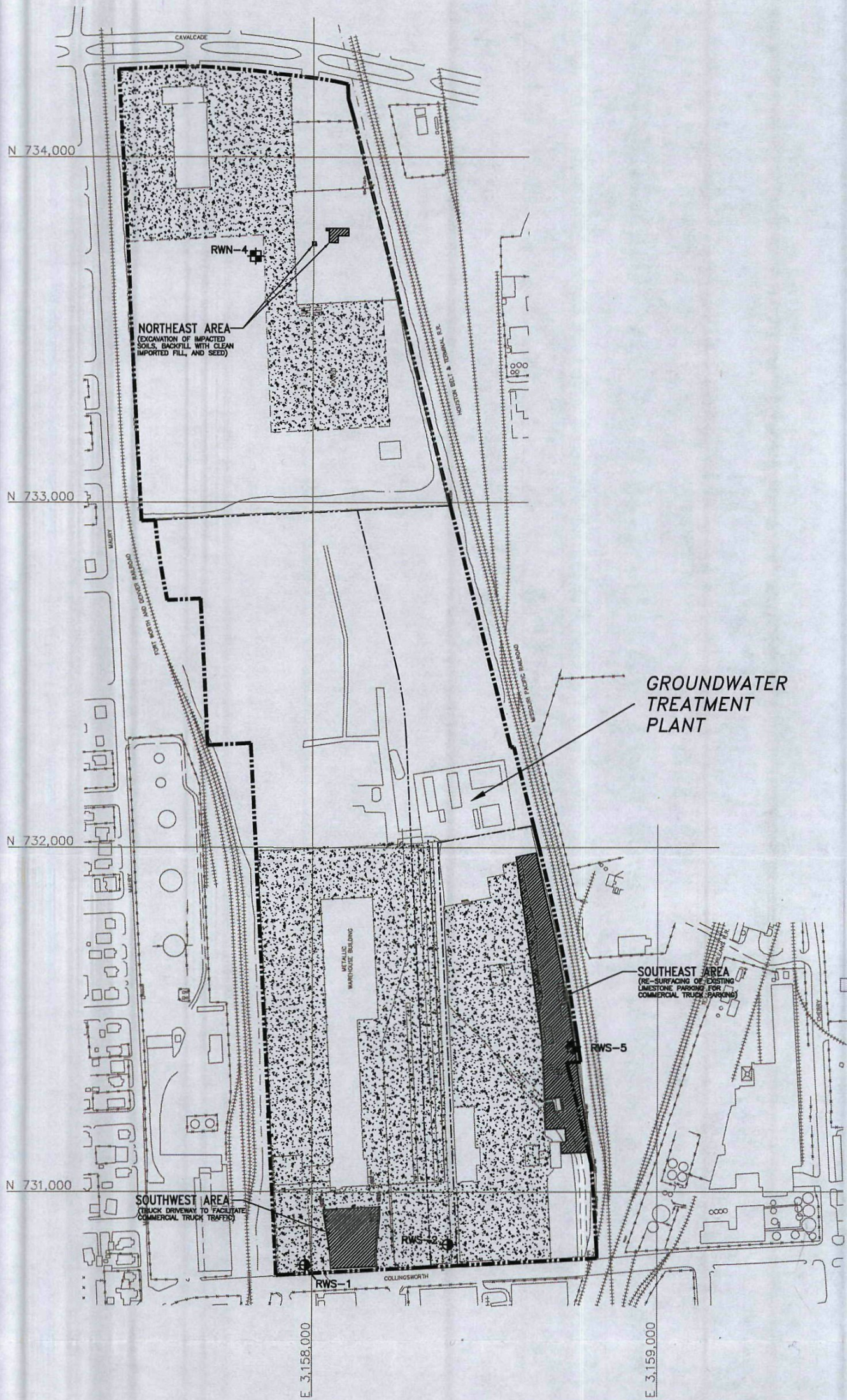
KEY ENVIRONMENTAL
INCORPORATED

SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
BEAZER EAST, INC.
HOUSTON, TEXAS

SITE LOCATION MAP

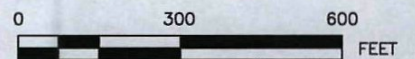
PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 1-1

FILE: Y:\SOUTH CAVALCADE\05-113\FIG-1-1.DWG



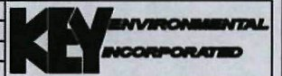
LEGEND:

- SOUTH CAVALCADE SITE BOUNDARY
- PROPERTY BOUNDARIES
- AREAS COVERED WITH ASPHALT OR CONCRETE
- CONCRETE CAP AND EXCAVATION AREAS



BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BKC DATE: 3/1/06
CHKD: RMB DATE: 3/1/06
APPD: JSZ DATE: 3/1/06
SCALE: AS SHOWN



SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

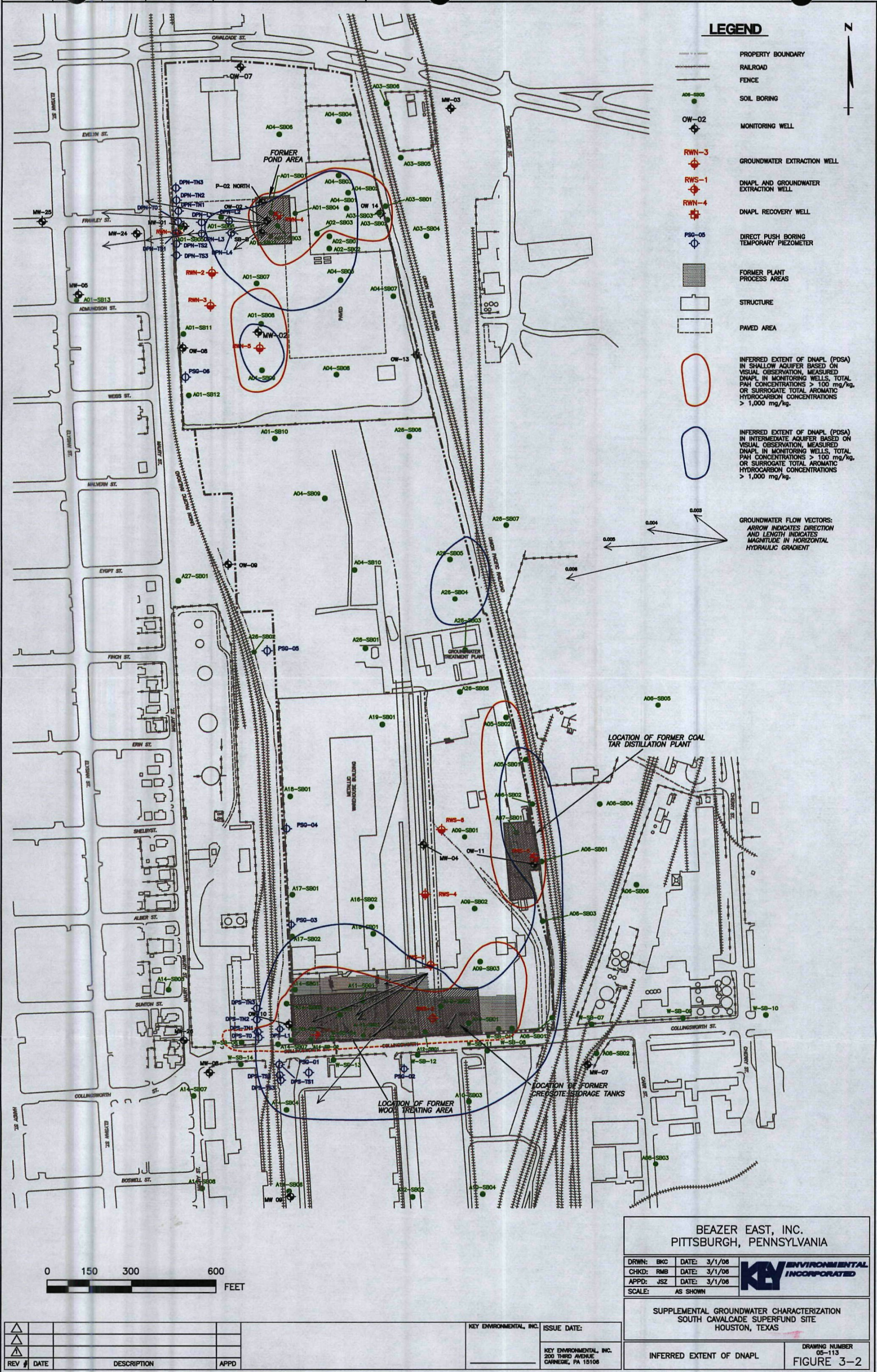
SITE PLAN

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 3-1

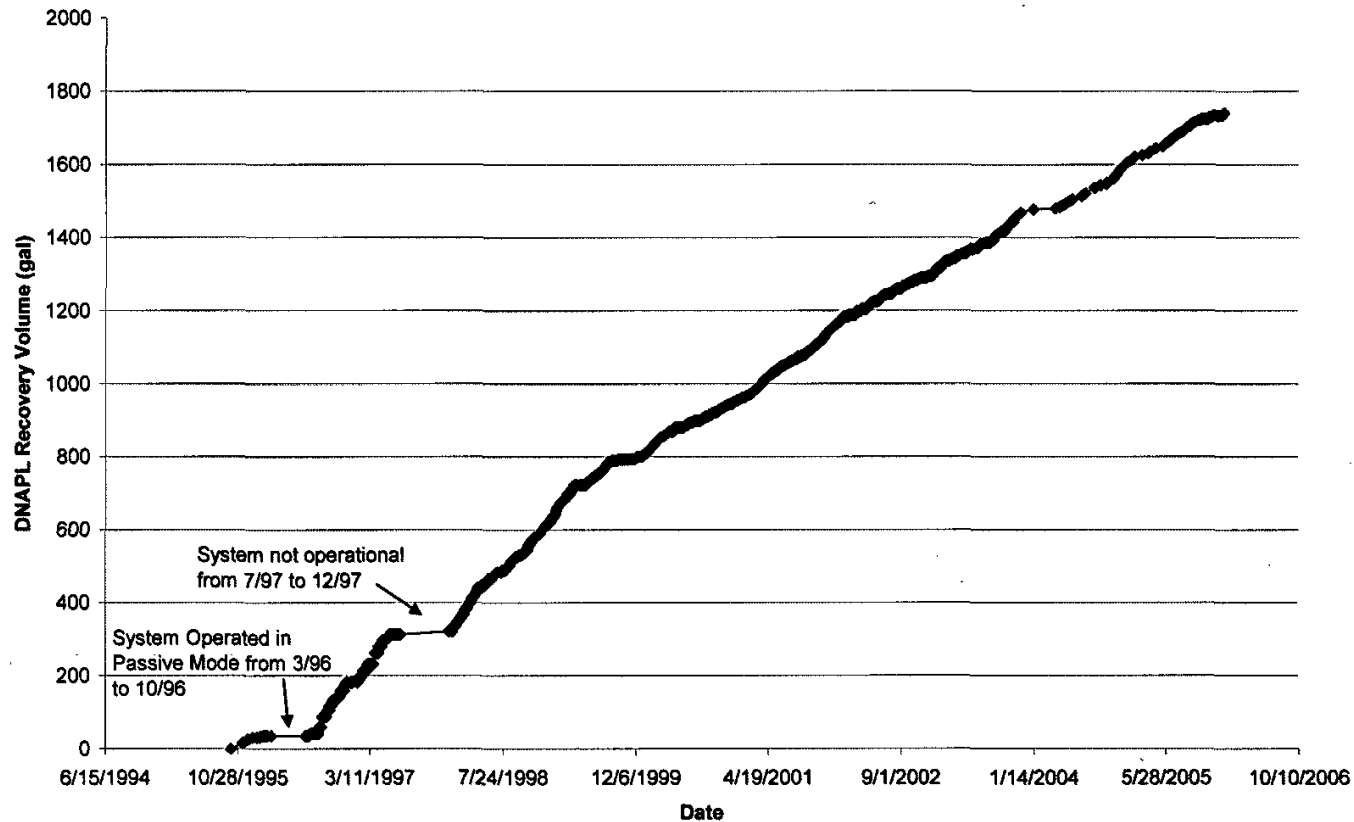
KEY ENVIRONMENTAL, INC. ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

REV #	DATE	DESCRIPTION	APPD
1			
2			
3			



RWS-1 Cumulative DNAPL Recovery



BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BKC DATE: 3/1/06
CHKD: RMB DATE: 3/1/06
APPD: JSZ DATE: 3/1/06
SCALE: N.T.S.



SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REFERENCE:

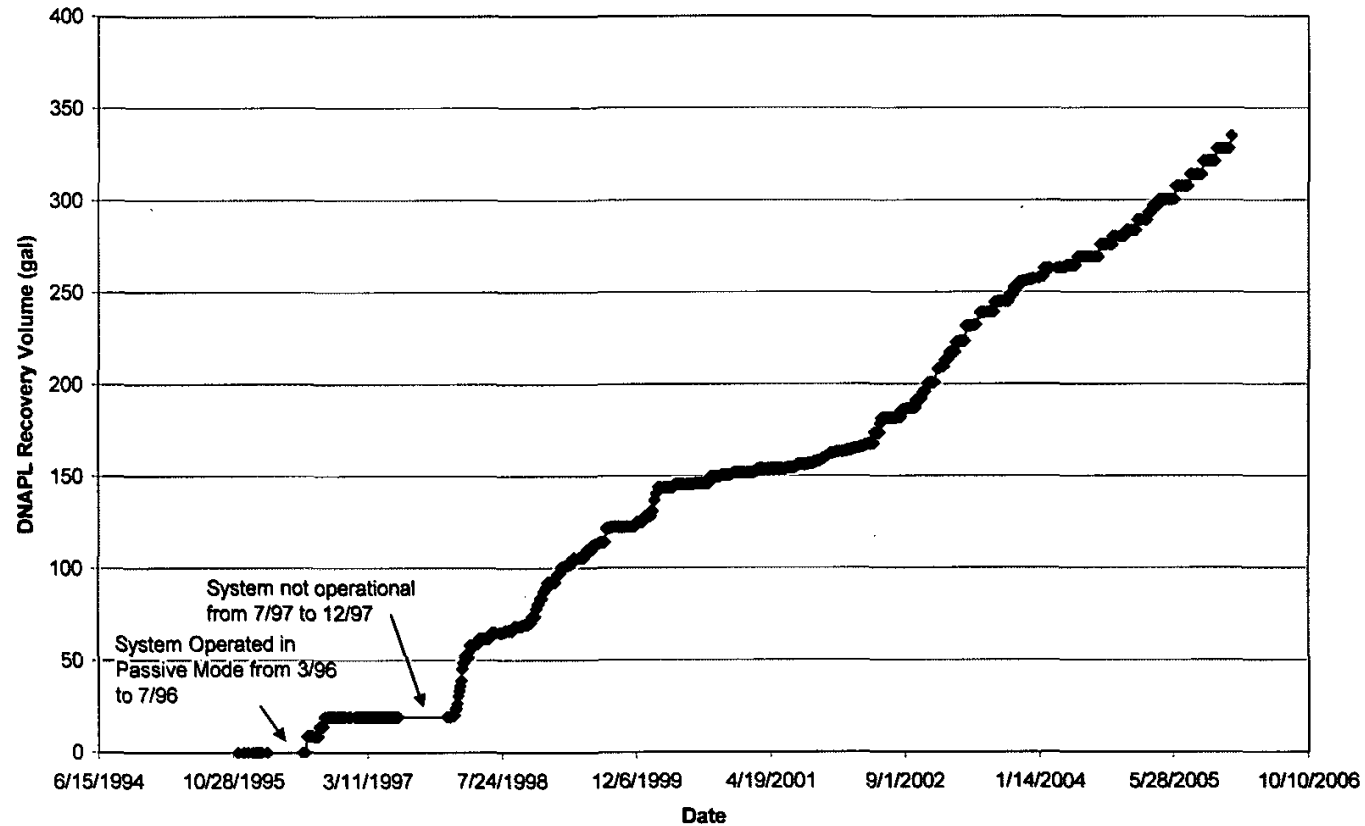
ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

RWS-1 CUMULATIVE DNAPL RECOVERY

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 3-3

RWS-2 Cumulative DNAPL Recovery



BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BKC DATE: 3/1/06
CHKD: RMB DATE: 3/1/06
APPD: JSZ DATE: 3/1/06
SCALE: N.T.S.



SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REFERENCE:

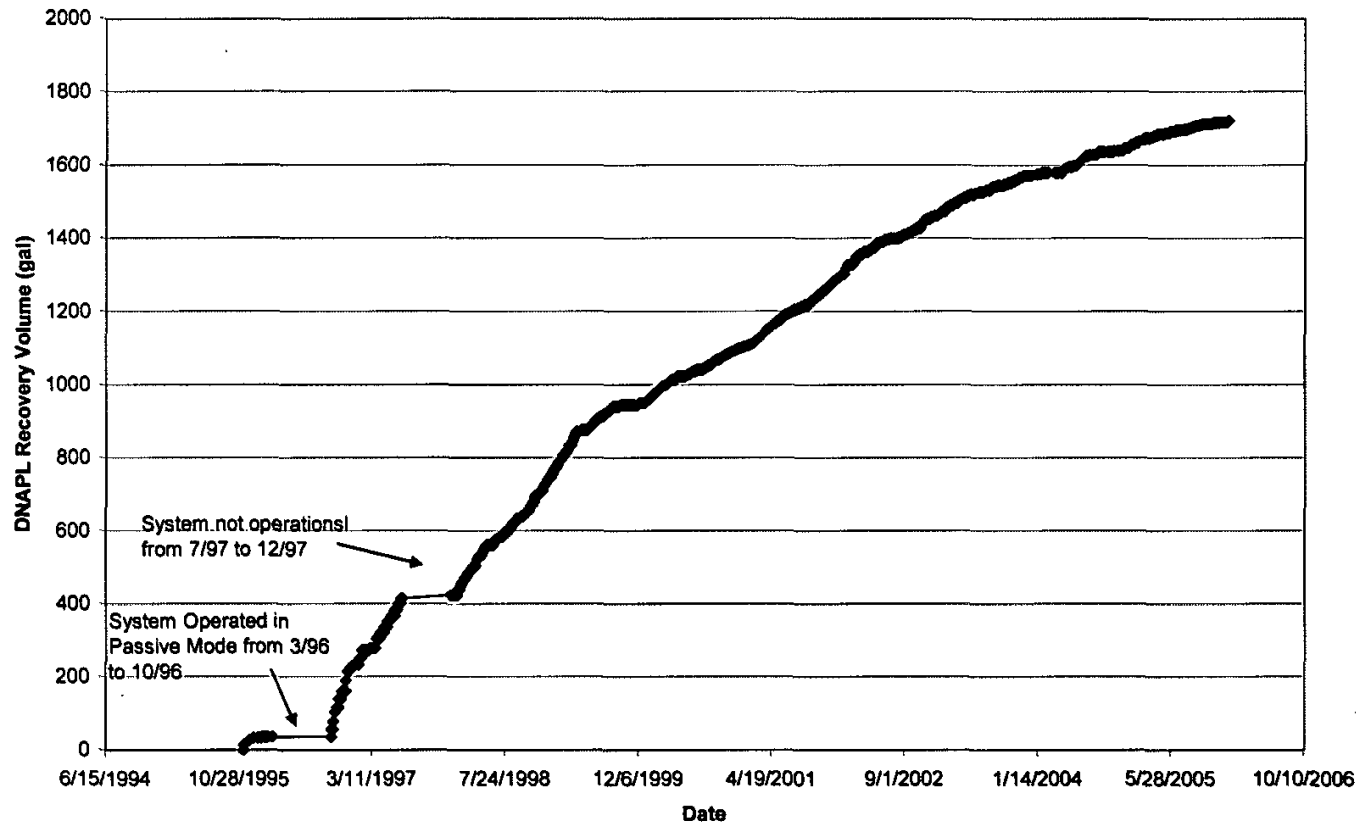
ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

RWS-2 CUMULATIVE DNAPL RECOVERY

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 3-4

RWN-4 Cumulative DNAPL Recovery



BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BKC DATE: 3/1/06
CHKD: RMB DATE: 3/1/06
APPD: JSZ DATE: 3/1/06
SCALE: N.T.S.



SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REFERENCE:

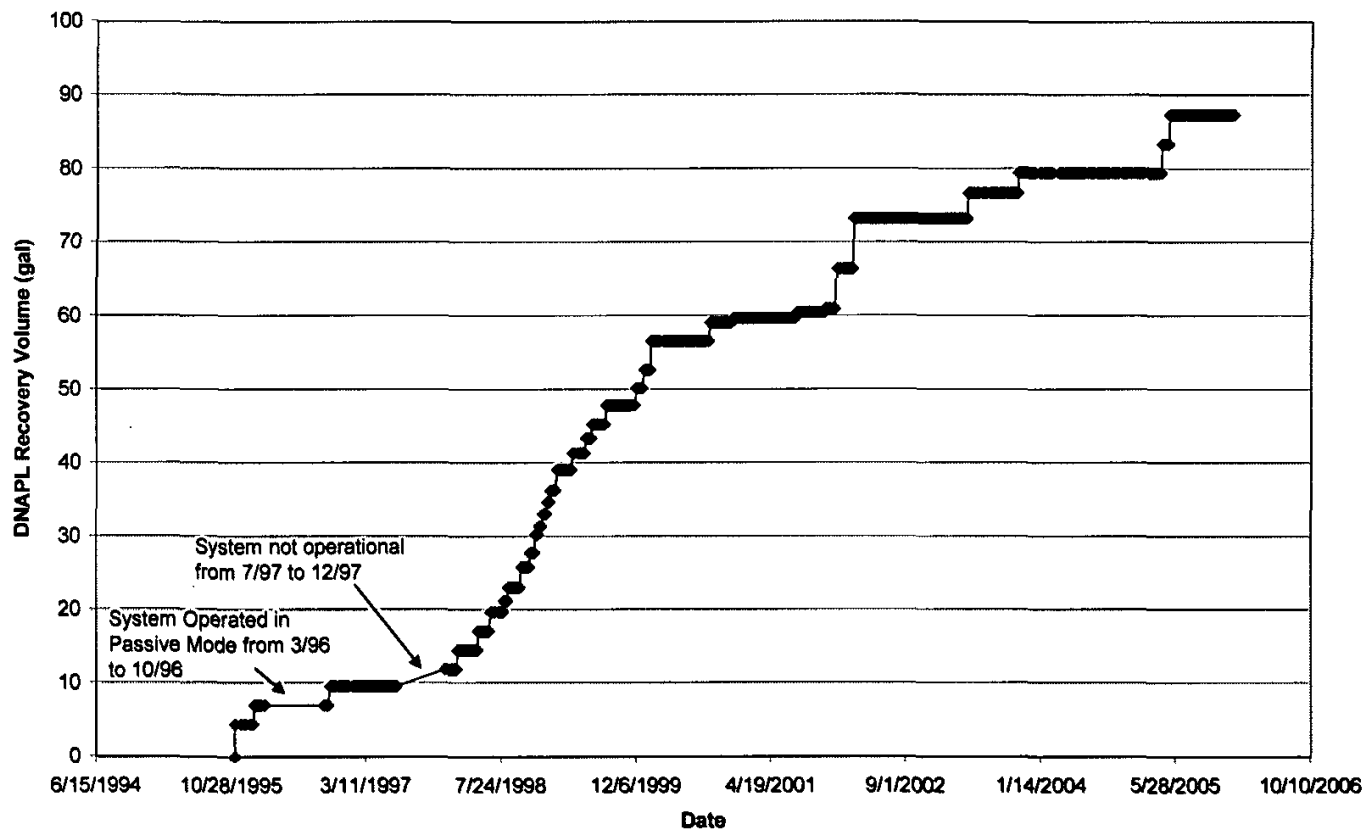
ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

RWS-4 CUMULATIVE DNAPL RECOVERY

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 3-5

RWS-5 Cumulative DNAPL Recovery



BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BKC DATE: 3/1/06
CHKD: RMB DATE: 3/1/06
APPD: JSZ DATE: 3/1/06
SCALE: N.T.S.

KEY ENVIRONMENTAL
INCORPORATED

SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

REFERENCE:

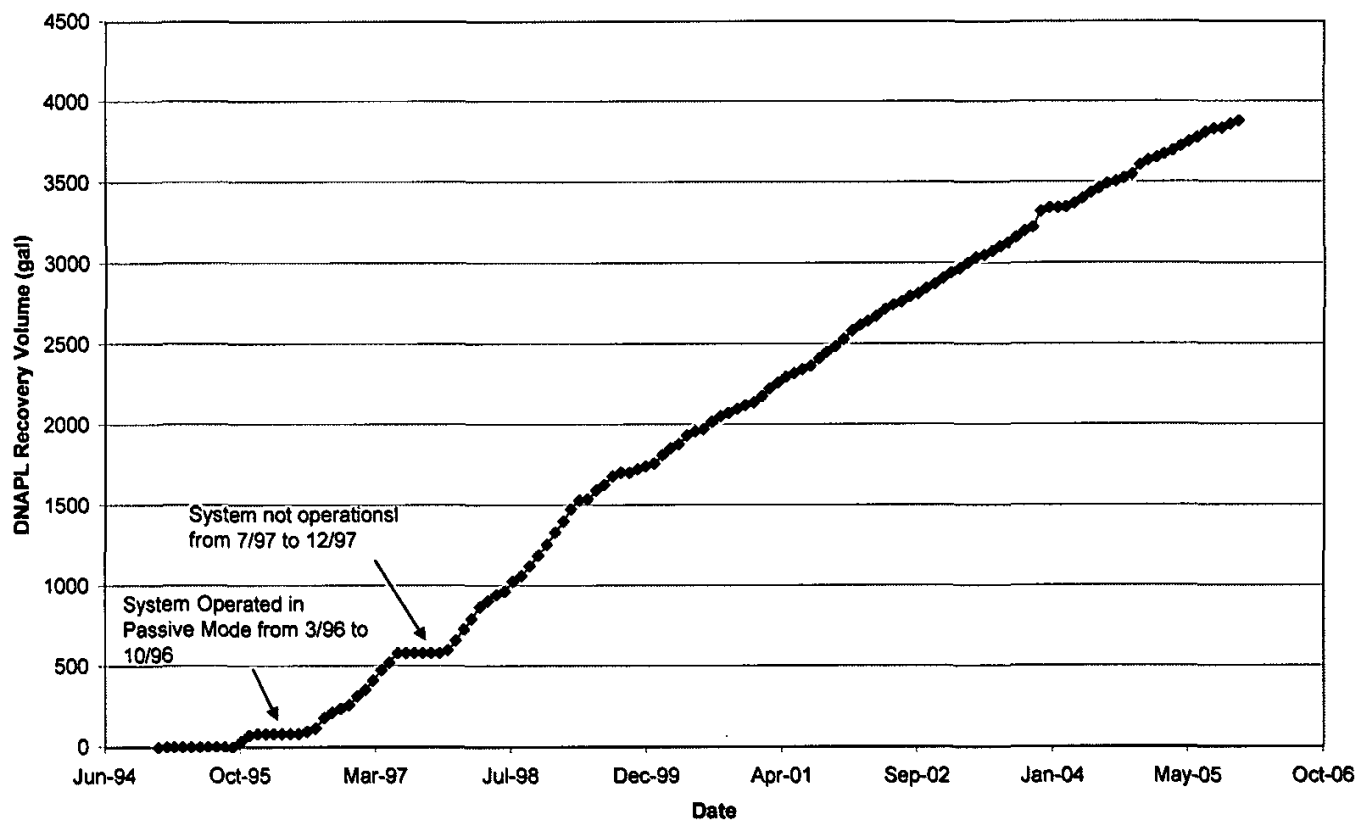
ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

RWS-5 CUMULATIVE DNAPL RECOVERY

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 3-6

Cumulative Site DNAPL Recovery



BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BKC DATE: 3/1/06
CHKD: RMB DATE: 3/1/06
APPD: JSZ DATE: 3/1/06
SCALE: N.T.S.



SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

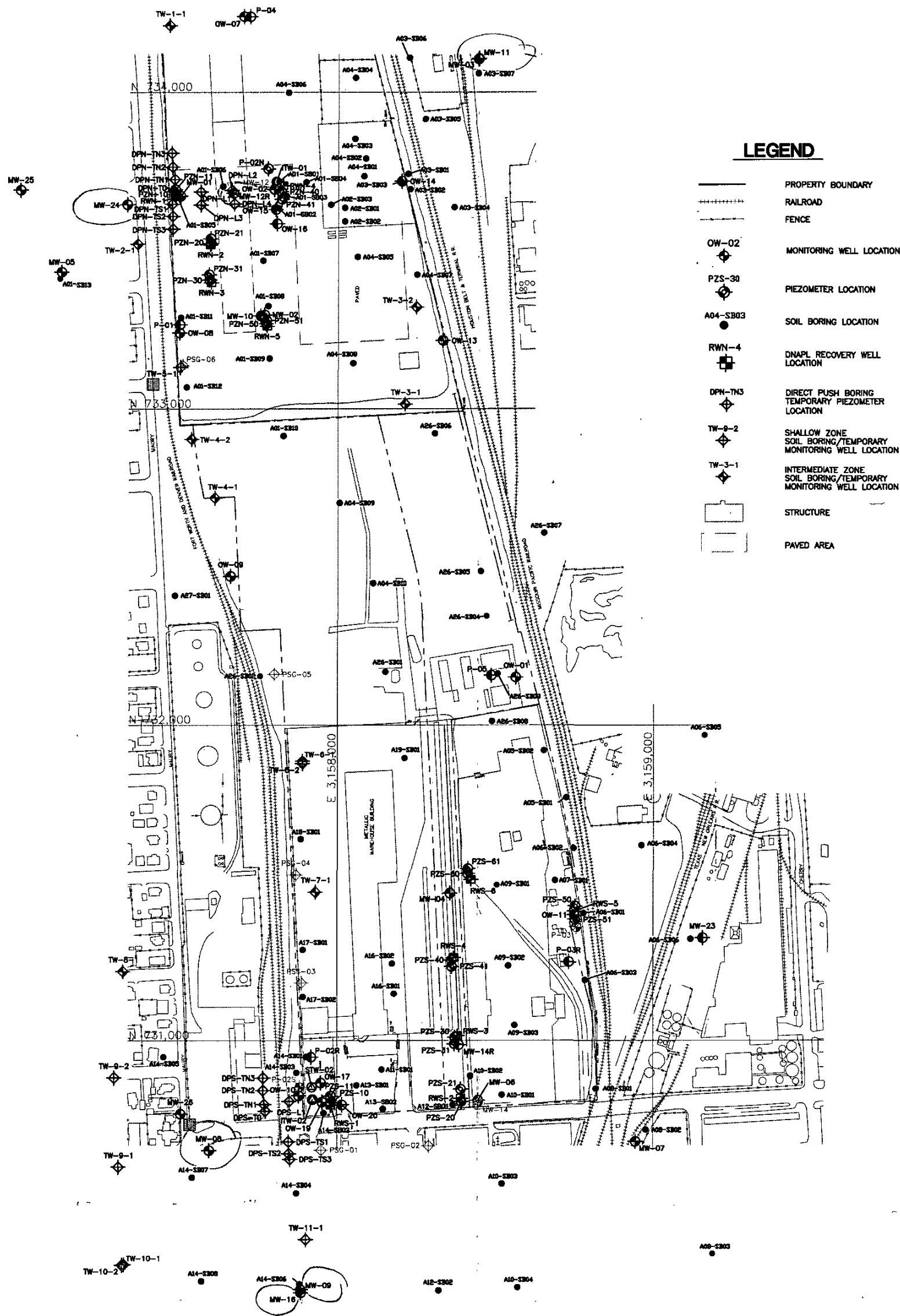
REFERENCE:

ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

CUMULATIVE SITE DNAPL RECOVERY

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 3-7



REV	DATE	DESCRIPTION	APPD

KEY ENVIRONMENTAL, INC.	ISSUE DATE:
KEY ENVIRONMENTAL, INC.	200 THIRD AVENUE
	CARNEGIE, PA 15108

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

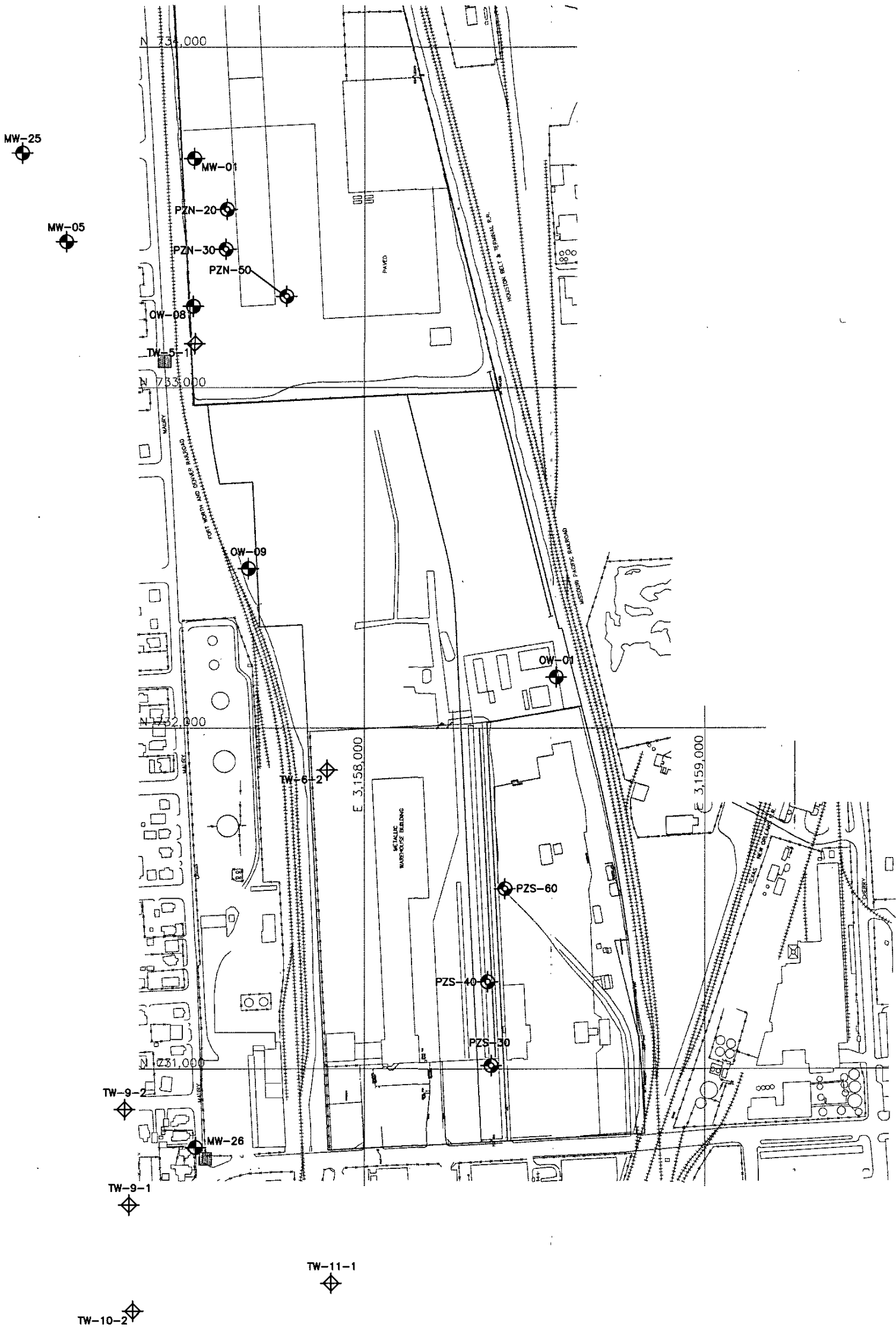
DRWN: BKC DATE: 3/1/08
CHKD: RMB DATE: 3/1/08
APPD: JSZ DATE: 3/1/08
SCALE: AS SHOWN

KEY ENVIRONMENTAL
INCORPORATED




SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

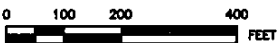
SOIL BORING/TEMPORARY WELL
LOCATION MAP


PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 4-1

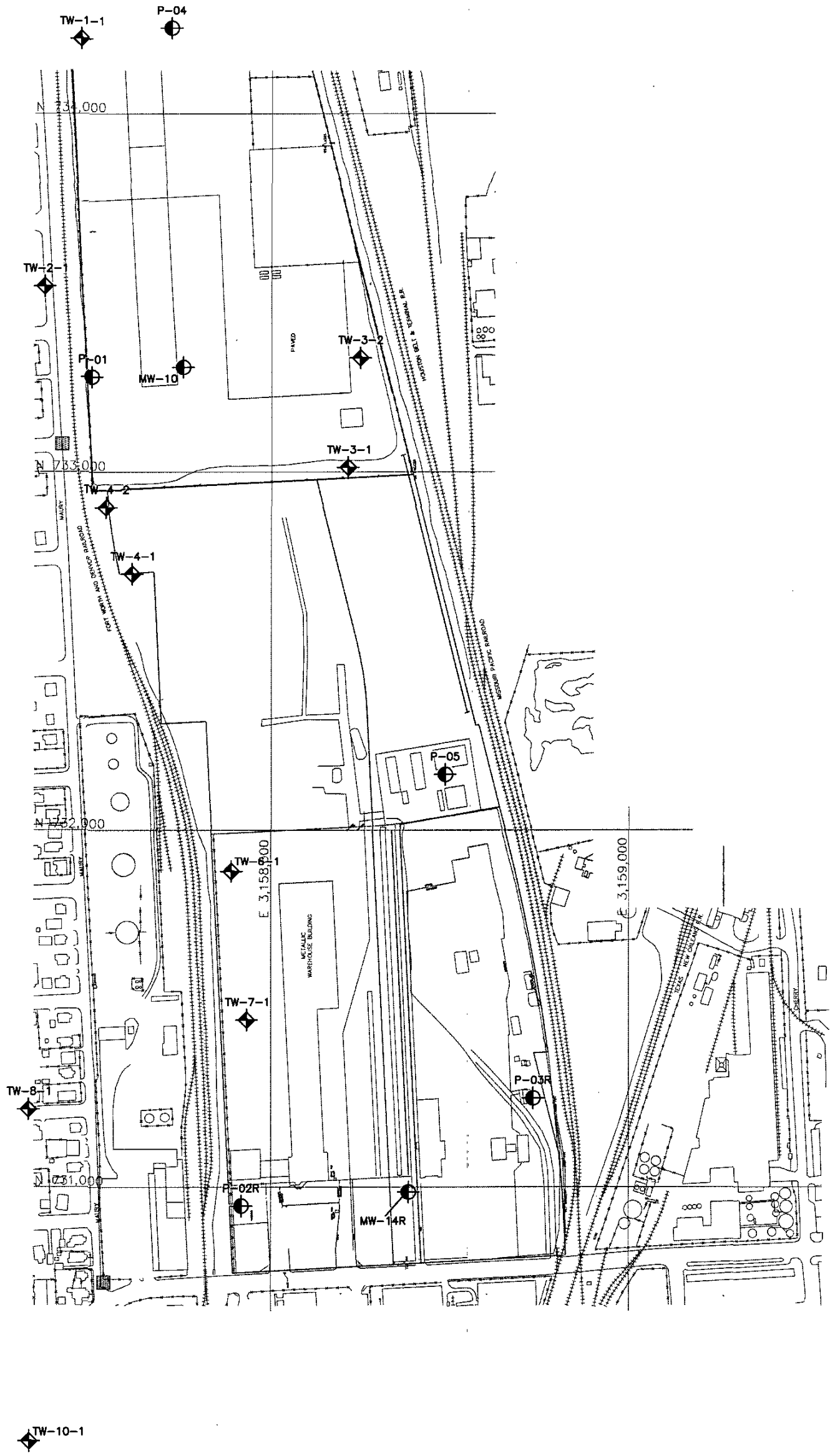


LEGEND:



- MW-09
 MONITORING WELL LOCATION
- TW-11-1
 TEMPORARY MONITORING WELL LOCATION
- PZS-30
 PIEZOMETER LOCATION

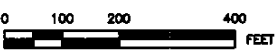



BEAZER EAST, INC. PITTSBURGH, PENNSYLVANIA			
DRWN: BKC	DATE: 3/1/06		
CHKD: RMB	DATE: 3/1/06		
APPD: JSZ	DATE: 3/1/06		
SCALE: AS SHOWN			
SUPPLEMENTAL GROUNDWATER CHARACTERIZATION SOUTH CAVALCADE SUPERFUND SITE HOUSTON, TEXAS			
SHALLOW ZONE GROUNDWATER SAMPLE LOCATIONS		PROJECT NO: 05-113 DRAWING NUMBER FIGURE 4-2	

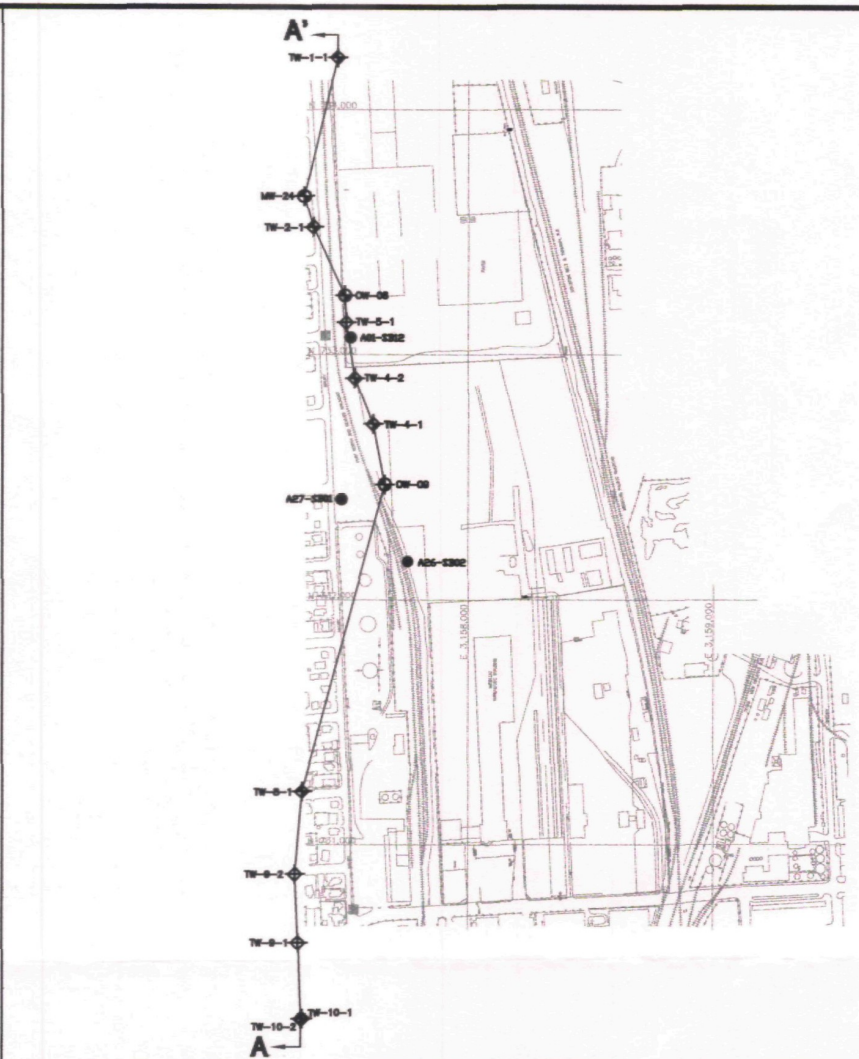
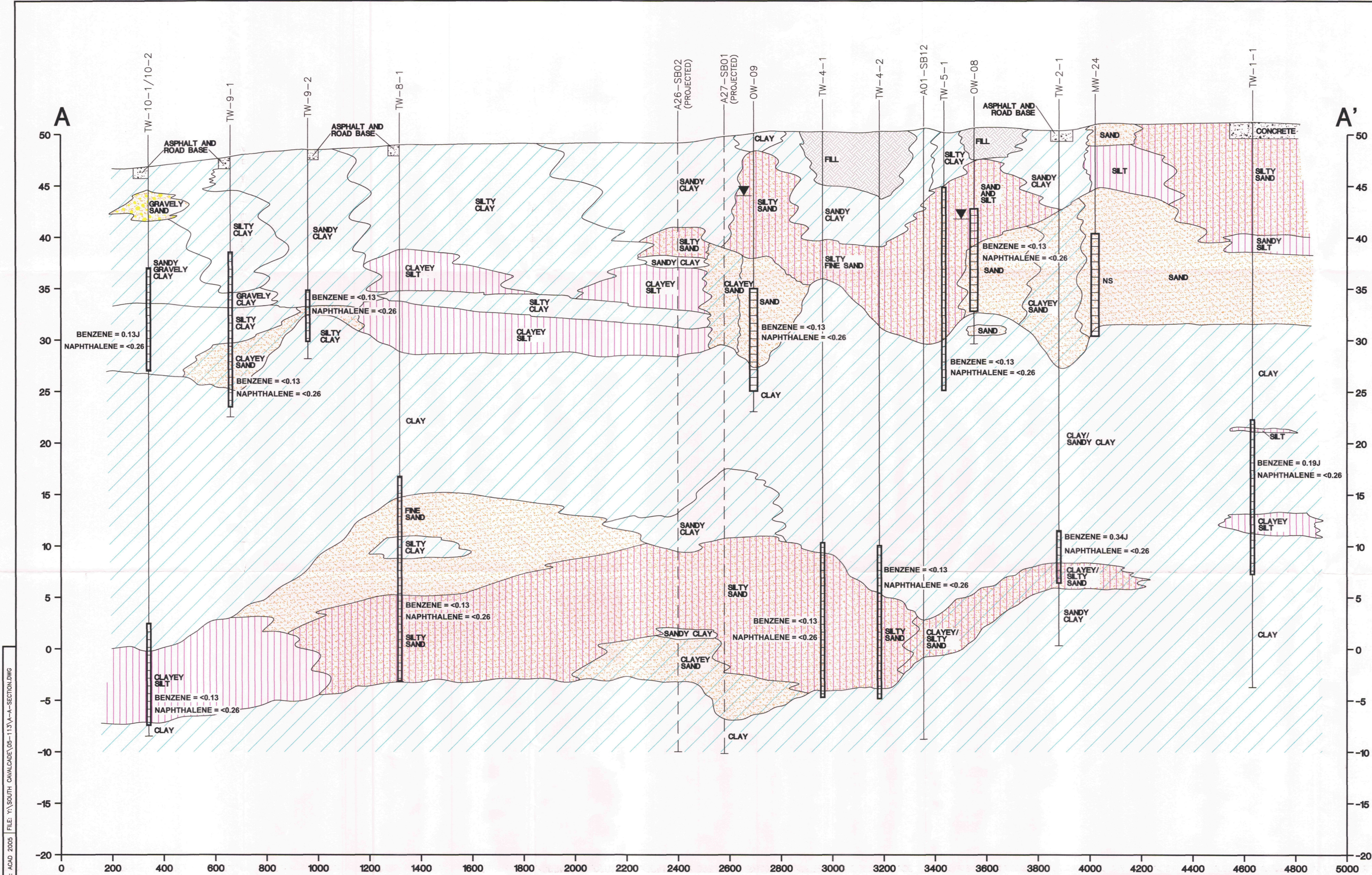


LEGEND:

- MW-10
 MONITORING WELL LOCATION
- TW-10-1
 TEMPORARY MONITORING WELL LOCATION



BEAZER EAST, INC. PITTSBURGH, PENNSYLVANIA	
DRWN: BKC	DATE: 3/1/06
CHKD: RMB	DATE: 3/1/06
APPD: JSZ	DATE: 3/1/06
SCALE: AS SHOWN	
SUPPLEMENTAL GROUNDWATER CHARACTERIZATION SOUTH CAVALCADE SUPERFUND SITE HOUSTON, TEXAS	
INTERMEDIATE ZONE GROUNDWATER SAMPLE LOCATIONS	
PROJECT NO: 05-113 DRAWING NUMBER FIGURE 4-3	



CROSS SECTION LOCATION

LEGEND

- GRAVELLY SAND
- CONCRETE, ASPHALT AND ROAD BASE
- FILL
- SAND
- SILT, CLAYEY SILT, SANDY SILT
- SILTY SAND
- CLAY, SANDY CLAY, SILTY CLAY
- CLAYEY SAND

WATER LEVEL MEASURED
9/16 - 9/17 2005

SOIL BORING LOCATION

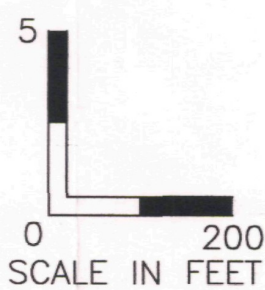
MONITORING WELL/SCREEN
INTERVAL LOCATION

BENZENE = ug/L
NAPHTHALENE = ug/L

TEMPORARY WELL/SCREEN
INTERVAL LOCATION

BENZENE = ug/L
NAPHTHALENE = ug/L

NOTES:
NS - NOT SAMPLED, UNABLE TO LOCATE WELL



BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: BKC	DATE: 3/1/06	KEY ENVIRONMENTAL INCORPORATED
CHKD: RMB	DATE: 3/1/06	
APPD: JSZ	DATE: 3/1/06	
SCALE:	AS SHOWN	

SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

GEOLOGIC CROSS SECTION A-A'

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 5-1

ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

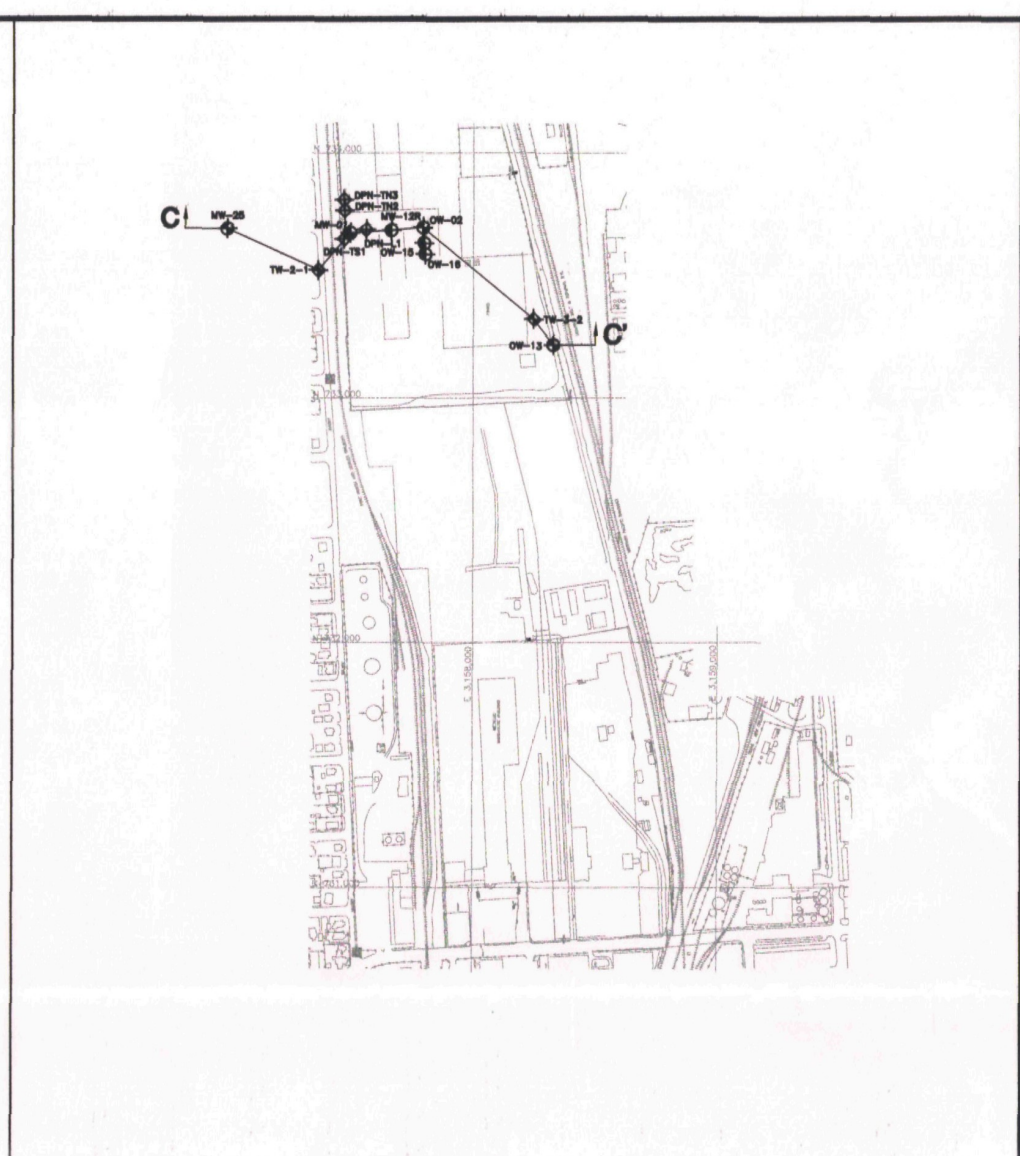
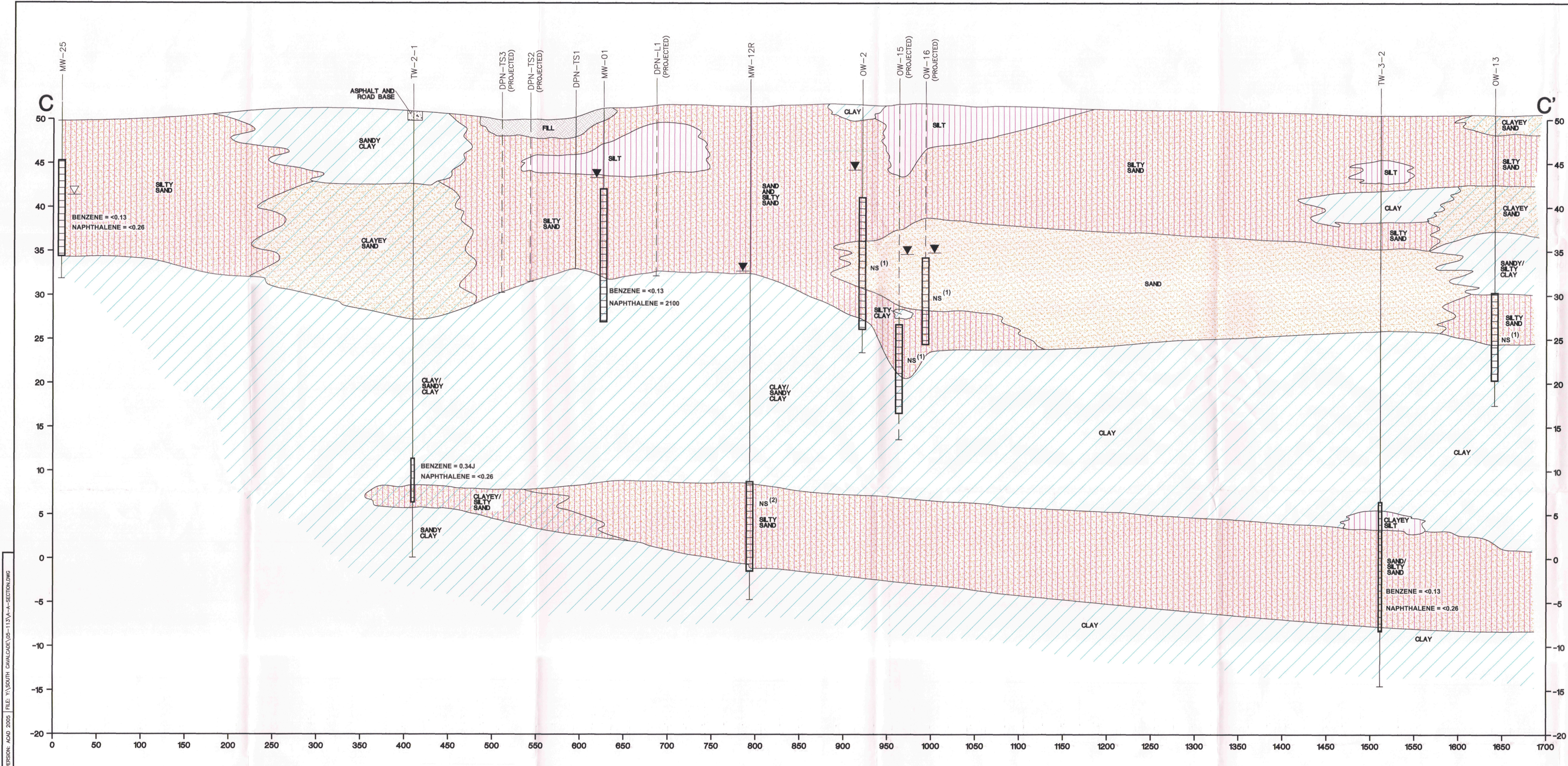
VERSION: ACAD 2005
FILE: Y:\SOUTH CAVALCADE\05-113\A-A-SECTION.DWG

PC:

LAYOUT: 1

REV	DATE	DESCRIPTION	APPD

REFERENCE:



CROSS SECTION LOCATION

LEGEND

	ASPHALT AND ROAD BASE		SILT, CLAYEY SILT, SANDY SILT
	FILL		SILTY SAND
	SAND		CLAY, SANDY CLAY, SILTY CLAY
	CLAYEY SAND		

WATER LEVEL MEASURED 9/16 - 9/17 2005

SOIL BORING LOCATION

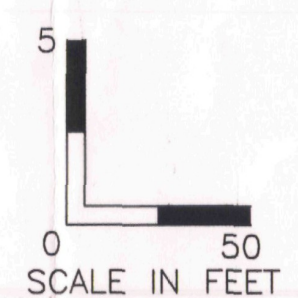
MONITORING WELL/SCREEN INTERVAL LOCATION

BENZENE = ug/L
NAPHTHALENE = ug/L

TEMPORARY WELL/SCREEN INTERVAL LOCATION

BENZENE = ug/L
NAPHTHALENE = ug/L

NOTES:
NS(1) - NOT SAMPLED AS PART OF THIS INVESTIGATION
NS(2) - NOT SAMPLED DUE TO PRESENCE OF DNAPL



REV	#	DATE	DESCRIPTION	APPD

REFERENCE:

ISSUE DATE:
KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

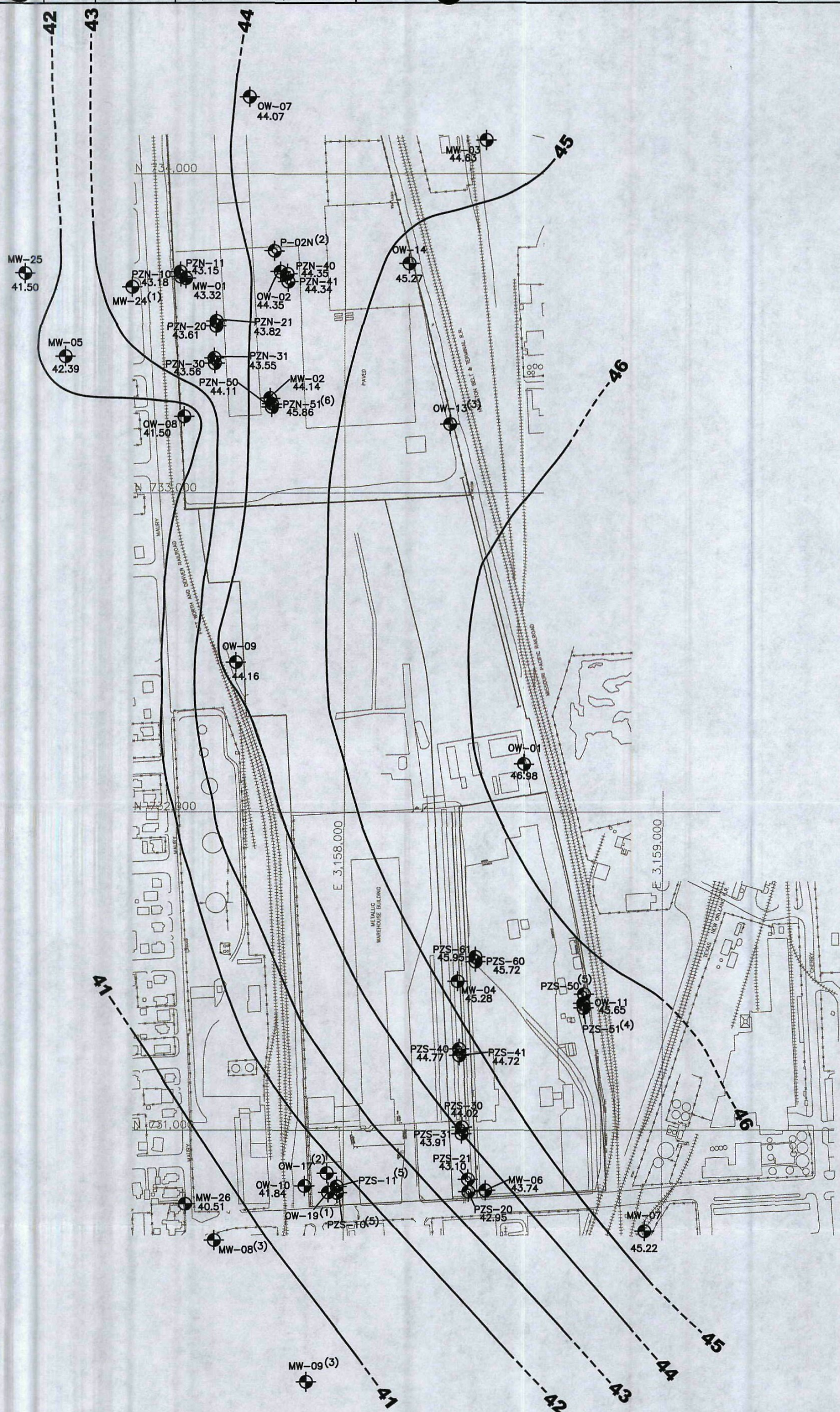
DRWN: BKC	DATE: 3/1/06
CHKD: RMB	DATE: 3/1/06
APPD: JSZ	DATE: 3/1/06
SCALE: AS SHOWN	

KEY ENVIRONMENTAL INCORPORATED

SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

GEOLOGIC CROSS SECTION C-C'

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 5-3



LEGEND:

MW-09

MONITORING WELL LOCATION

—45— POTENTIOMETRIC SURFACE CONTOURS
(FT-MSL) CONTOUR INTERVAL = 1'

44.16 POTENTIOMETRIC SURFACE
ELEVATION (FT-MSL)

NOTES:

- (1) DAMAGED WELL. UNABLE TO COLLECT MEASUREMENT
- (2) WELL NEEDS SURVEYED TO OBTAIN MEASURING POINT ELEVATION
- (3) WELL COULD NOT BE LOCATED
- (4) WELL UNDER JERSEY BARRIER - UNABLE TO COLLECT MEASUREMENT
- (5) WELLS PZS-50, PZS-11, AND PZS-10 NOT USED IN CONTOURING DUE TO FLUCTUATIONS IN WATER LEVELS CAUSED BY NEARBY PUMPING
- (6) WELL PZN-51 NOT USED IN CONTOURING WATER LEVEL ELEVATION SUSPECT

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

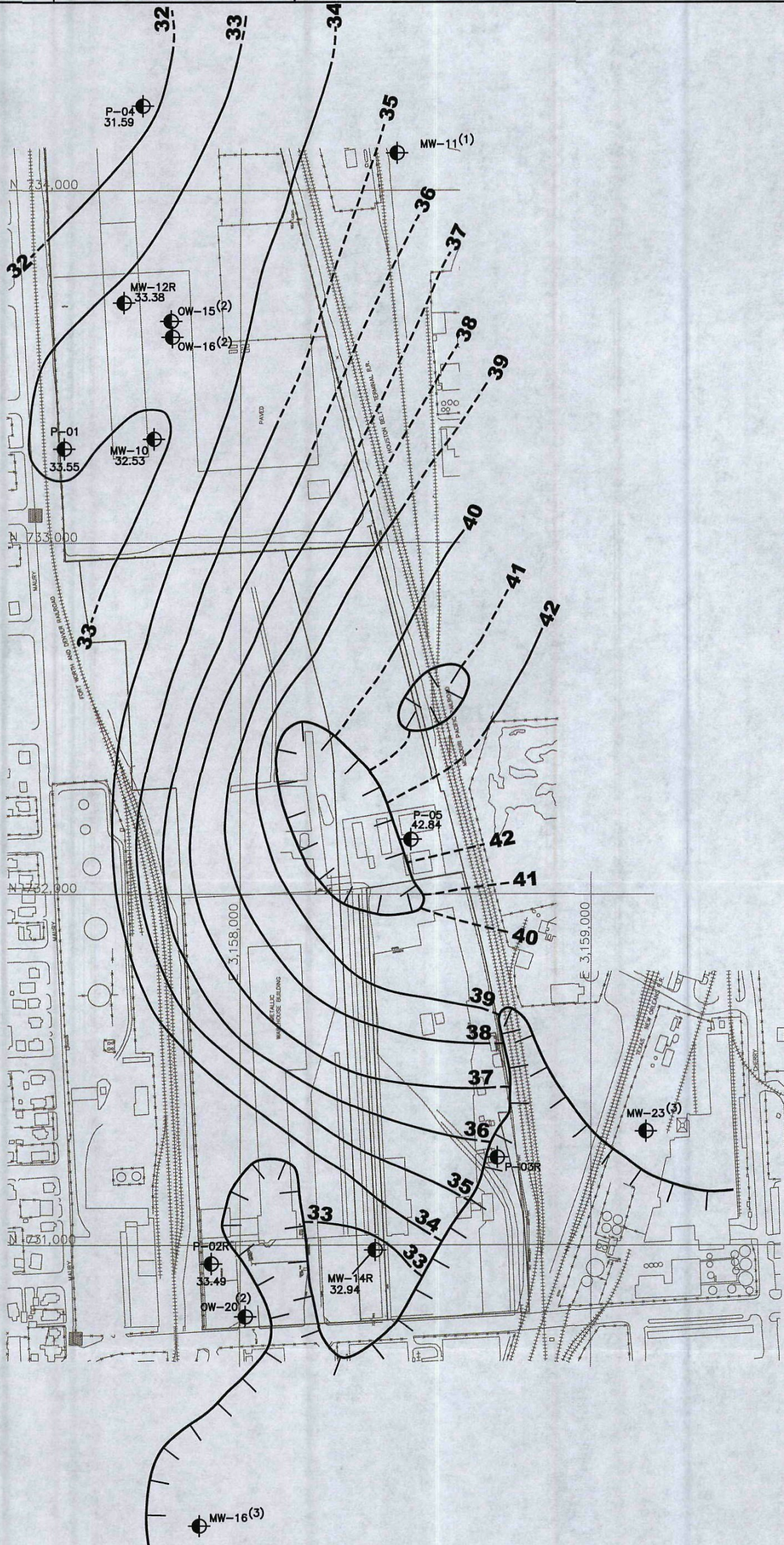
DRWN:	BKC	DATE:	3/1/06
CHKD:	RMB	DATE:	3/1/06
APPD:	JSZ	DATE:	3/1/06
SCALE:		AS SHOWN	

**KEY ENVIRONMENTAL
INCORPORATED**

SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

POTENTIOMETRIC SURFACE ELEVATION
CONTOUR MAP
SHALLOW AQUIFER 9/16-17/2005

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 5-4



LEGEND:

MW-10
MONITORING WELL LOCATION

—40— POTENTIOMETRIC SURFACE CONTOURS
(FT-MSL) CONTOUR INTERVAL = 1'

32.53 POTENTIOMETRIC SURFACE
ELEVATION (FT-MSL)

INTERMEDIATE ZONE SAND
IS ABSENT (4)

NOTES:

(1) DAMAGED WELL UNABLE
TO COLLECT MEASUREMENT

(2) WELL NEEDS SURVEYED TO
OBTAIN MEASURING POINT
ELEVATION

(3) WELL COULD NOT BE LOCATED

(4) AREA WHERE INTERMEDIATE ZONE
SAND IS ABSENT TAKEN FROM
MAPPING PREPARED BY EPA AND
PRESENTED DURING THE SEPTEMBER
8, 2004 MEETING

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

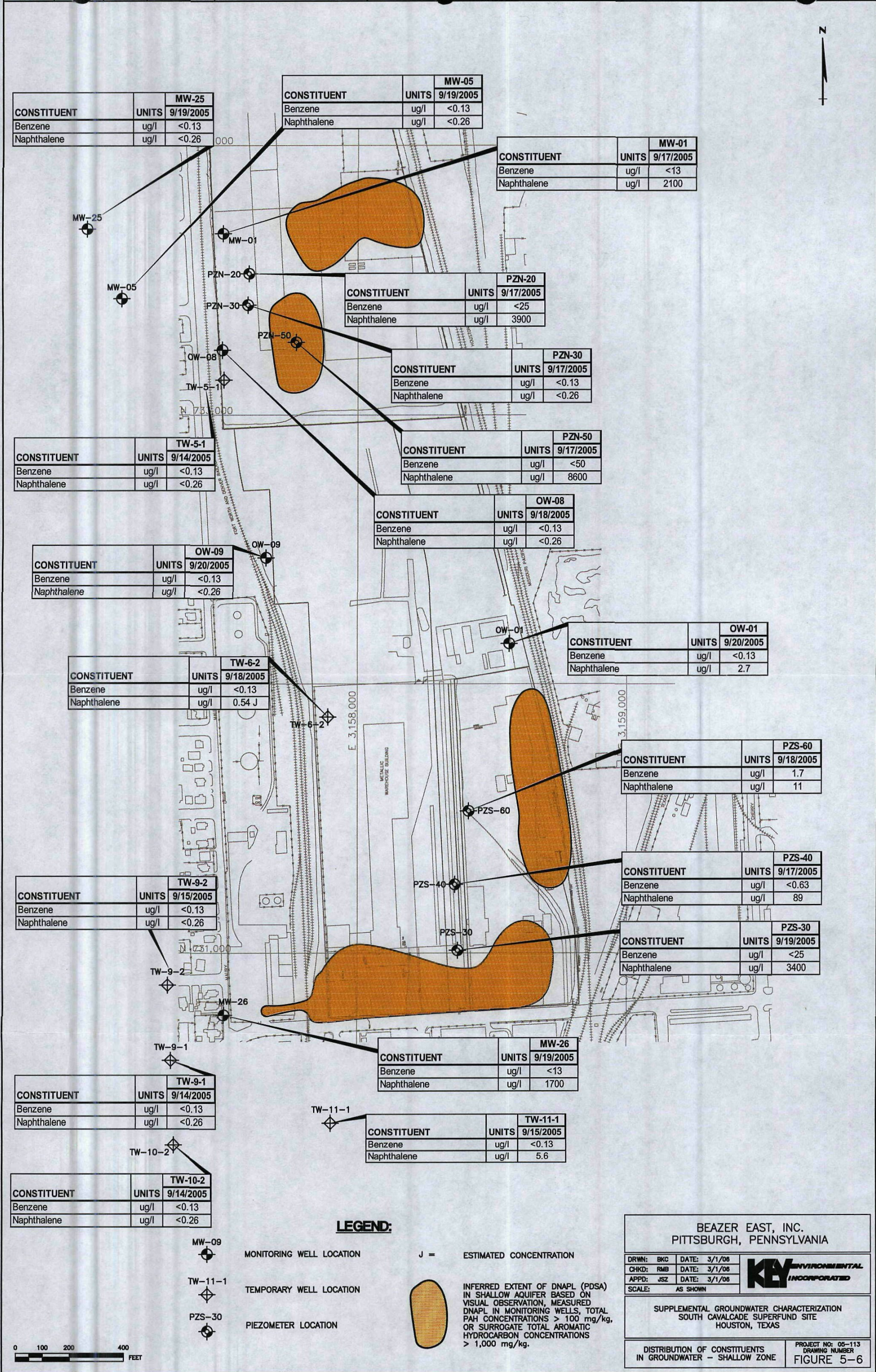
DRWN: BKC DATE: 3/1/06
CHKD: RMB DATE: 3/1/06
APPD: JSZ DATE: 3/1/06
SCALE: AS SHOWN

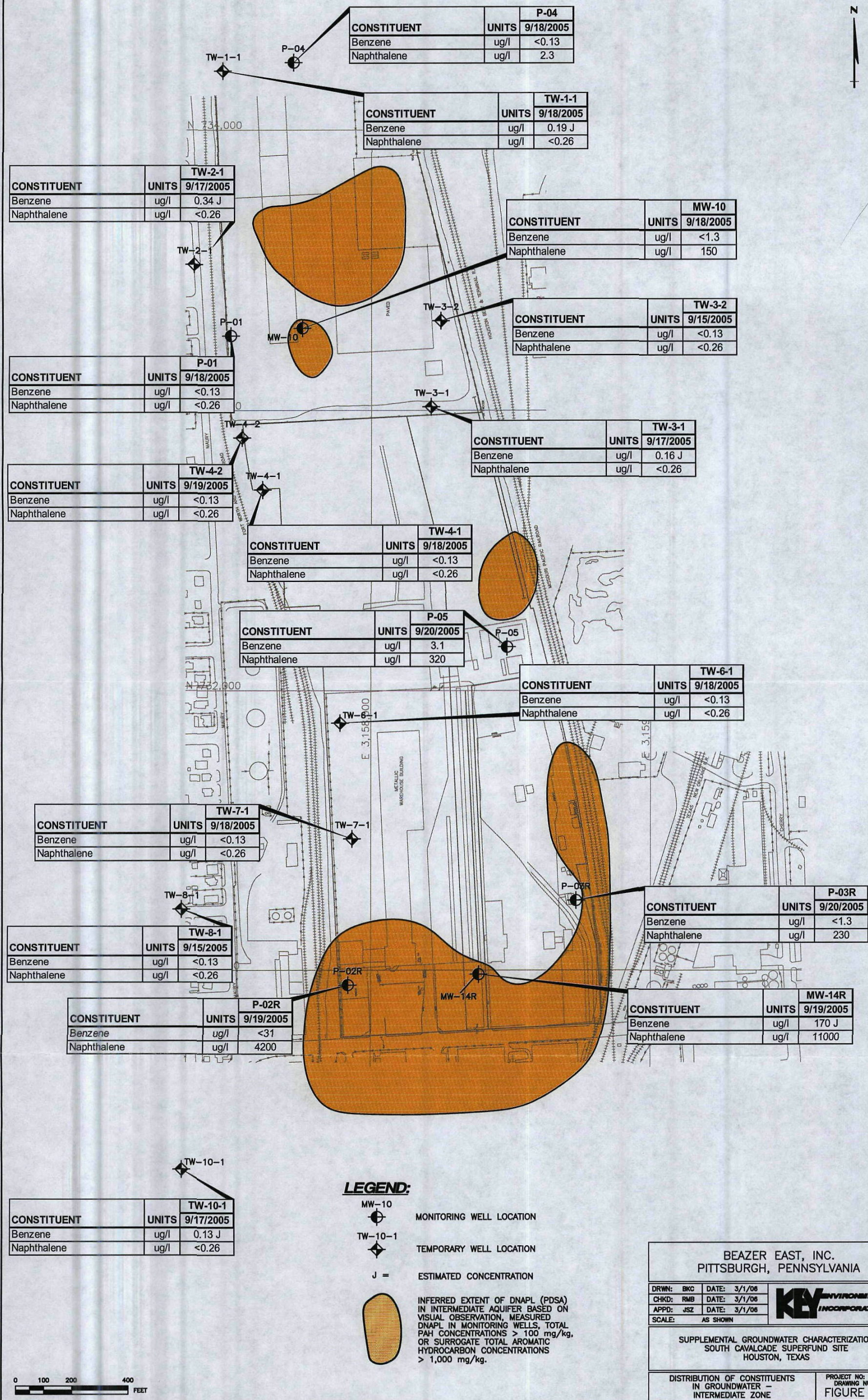
KEY ENVIRONMENTAL
INCORPORATED

SUPPLEMENTAL GROUNDWATER CHARACTERIZATION
SOUTH CAVALCADE SUPERFUND SITE
HOUSTON, TEXAS

POTENTIOMETRIC SURFACE ELEVATION
CONTOUR MAP
INTERMEDIATE AQUIFER 9/16-17-2005

PROJECT NO: 05-113
DRAWING NUMBER
FIGURE 5-5





**APPENDIX A
BORING/TEMPORARY WELL CONSTRUCTION LOGS**



LOG OF BORING: TW-1-1

Page 1 of 4

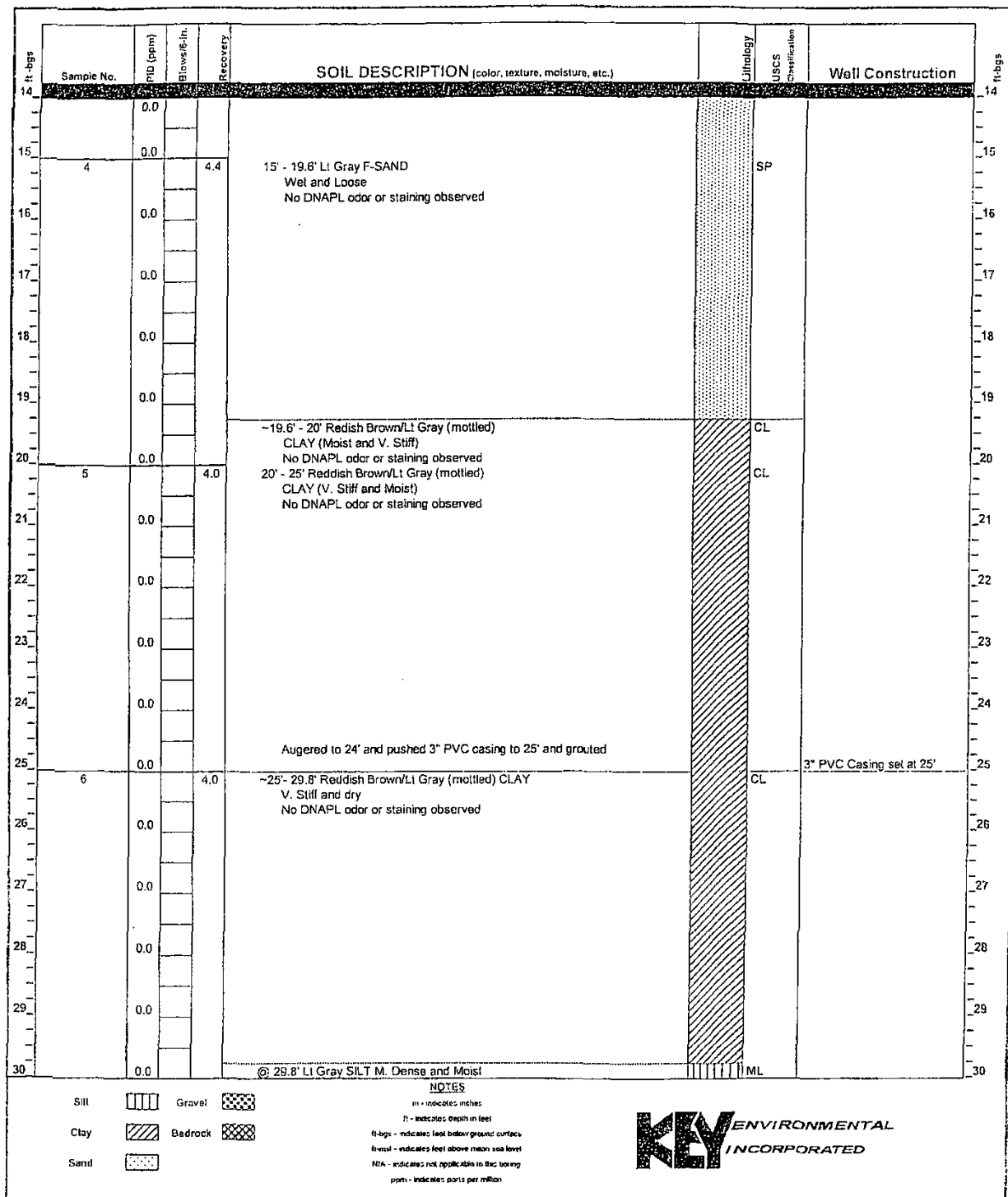
Client Name: BEAZER EAST		Drilling/Boring Method: Geoprobe		Total Boring Depth (ft): 55	
Project Number: 05-113		Sampling Method: 5' Split Spon		Ground Surface Elev. (ft-msl): 52.21	
Location: South Cavalcade: Houston, TX		Subcontractor/Drillers: Advanced Drilling Systems		Measuring Point Elev. (ft-msl): NA	
Date/Time Started: 9/13/2005		Monitoring Equipment: PID		Geologist/Engineer: Bob Balkovec	
Date/Time Completed: 9/15/2005		Coordinates: N734211.33 / E3157466.56		Consultant: KEY Environmental, Inc.	

Sample No.	PID (ppm)	Blows/ft	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1	0.0	2.1		-1.5' Concrete			TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-25.0 1" PVC: riser 0-29' screen 29-44'
	0.0			- 1.5 - 5 Gray Silty F-SAND Dry and M. Dense No DNAPL odor or staining observed		SM	
	0.0						
	0.0						
	0.0						
2	0.0	2.0		5' - 10' Gray Silty F-SAND Dry and M. Dense No DNAPL odor or staining observed		SM	
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						
3	0.0	4.7		Top .8' Gray Silty F-SAND Trace clay, Dry and M. Dense No DNAPL odor or staining observed		SM	
	0.0			-10.8' - 12.5' Yellow Orange/LI. Gray/Trace Black Flecks (mottled) Sandy SILT and Trace clay Moist and M. Dense to M. Stiff No DNAPL odor or staining observed			
	0.0			-12.5' - 15' Gray F-SAND I-silt Wet and Loose No DNAPL odor or staining observed			
	0.0						

<p>NOTES</p> <p>in - indicates inches</p> <p>ft - indicates depth in feet</p> <p>ft-bgs - indicates feet below ground surface</p> <p>ft-msl - indicates feet above mean sea level</p> <p>ppm - indicates parts per million</p>	<p>Signature of Field Supervisor</p> <p><i>Robert Balkovec</i></p>	<p>Date</p> <p>_____</p>
---	--	--------------------------

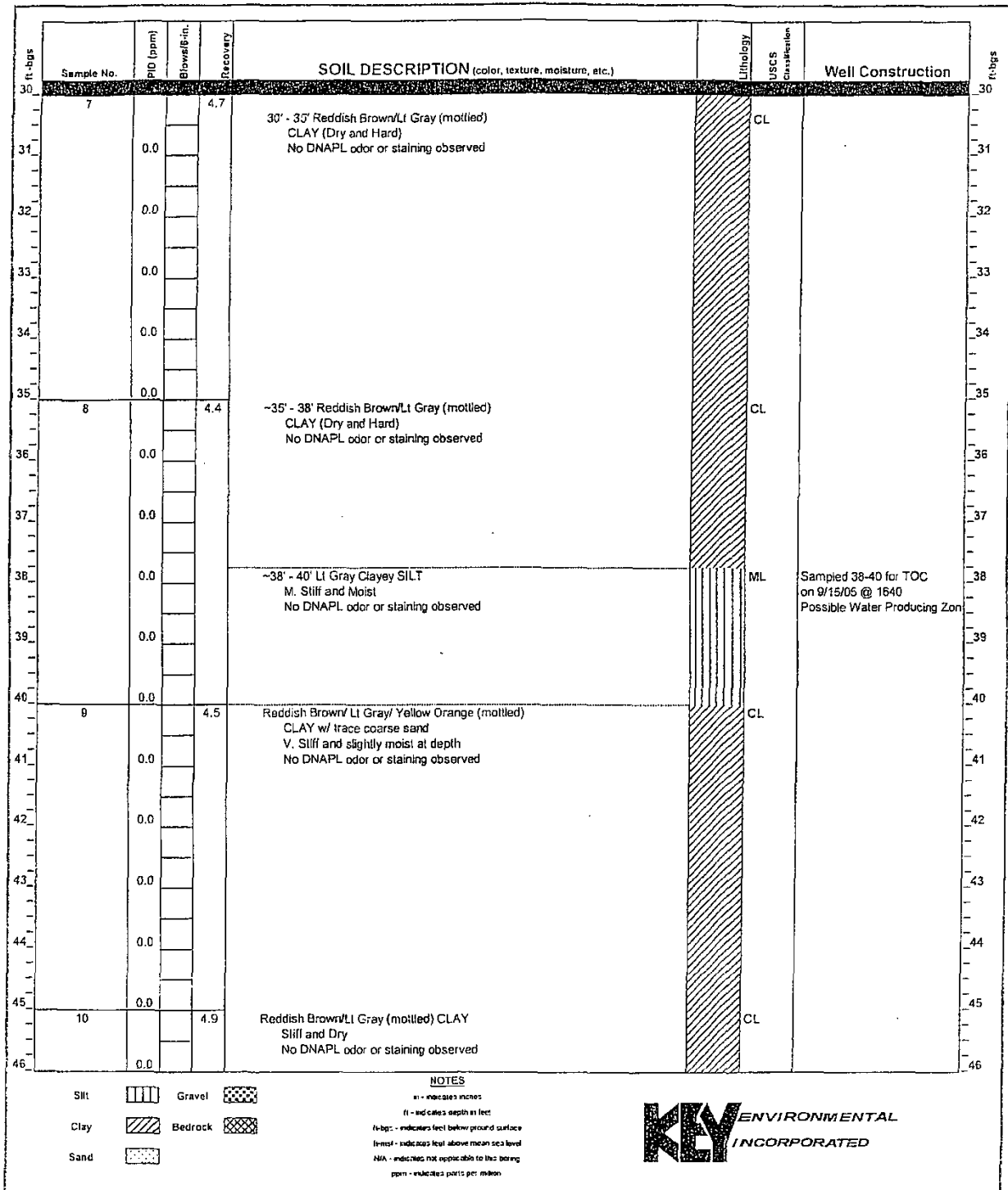
LOG OF BORING: TW-1-1 (con't)

Page 2 of 4



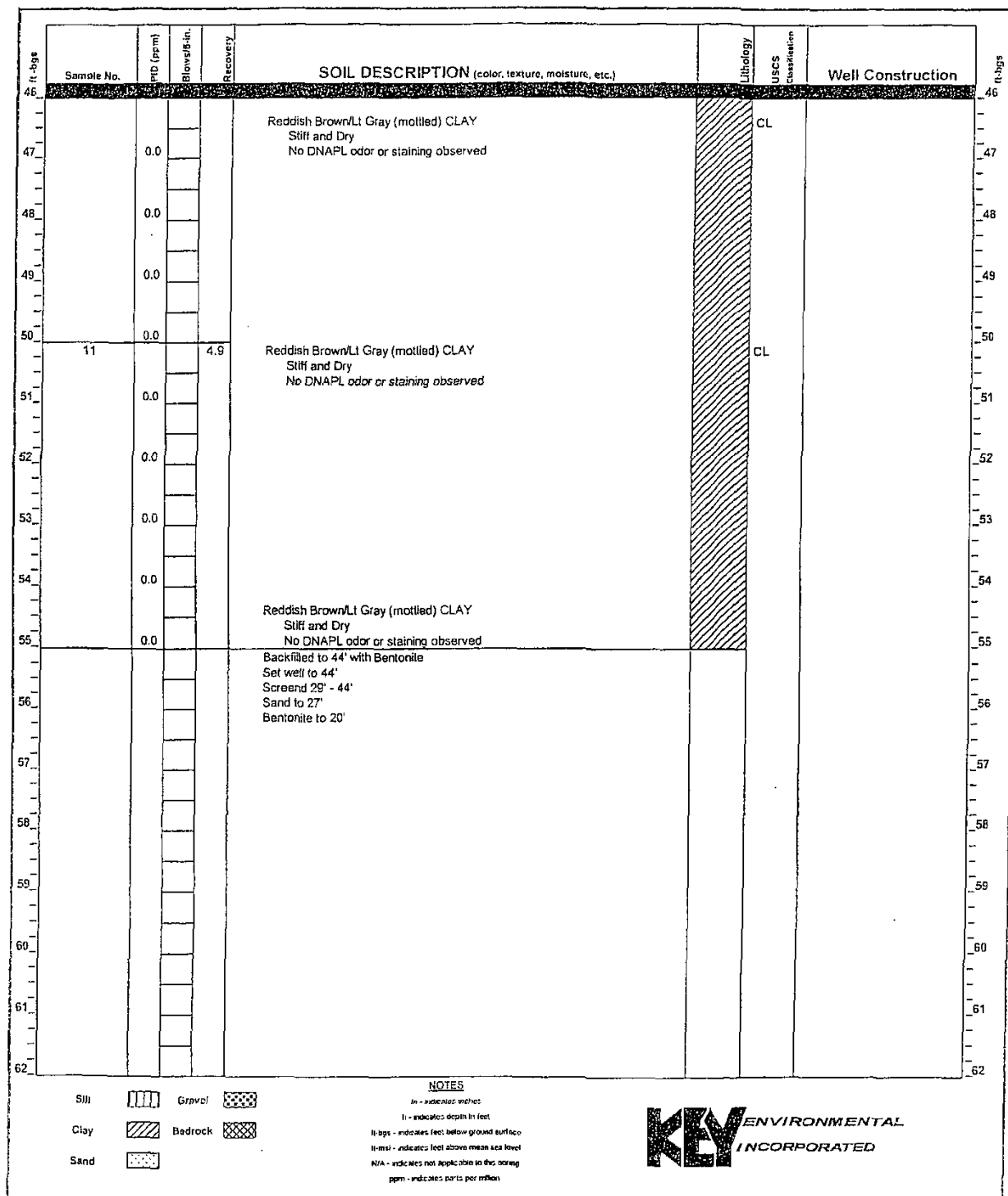
LOG OF BORING: TW-1-1 (con't)

Page 3 of 4



LOG OF BORING: TW-1-1 (con't)

Page 4 of 4





LOG OF BORING: TW-2-1

Page 1 of 4

Client Name: BEAZER EAST
Project Number: 05-113
Location: South Cavalcade: Houston, TX
Date/Time Started: 9/15/05 8:30
Date/Time Completed: 9/16/05 13:40
Drilling/Boring Method: Direct push
Sampling Method: Continuous split-spoon
Subcontractor/Drillers: Advanced Drilling Systems
Monitoring Equipment: PID
Coordinates: N733521.75 / E31573569.75
Total Boring Depth (ft): 50.0
Ground Surface Elev. (ft-msl): 50.61
Measuring Point Elev. (ft-msl): NA
Geologist/Engineer: P. Sorek
Consultant: KEY Environmental, Inc.

Sample No.	PID (ppm)	Blows (6-in.)	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1		5.0		Asphalt and road material.			TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-25.0 1" PVC: rise: 0-38.8' screen 38.8-43.8'
				Light gray SANDY CLAY. Well sorted, fine grained sand, approximately 20%. Medium stiff, and moist. No observed DNAPL stains or odors.	CL		
2	0.0	5.0					
	0.0						
	0.0			Buff to light gray CLAYEY SAND. Well sorted, fine-grained sand, approximately 60 to 80%. Soft and wet. No observed DNAPL stains or odors.	SC		
3	0.0	5.0					
	0.0						

NOTES

m - indicates depth in feet

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

Signature of Field Supervisor

Date

Silt

Clay

Sand

Gravel

Bedrock

LOG OF BORING: TW-2-1 (con't)

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ft. - bgs	Sample No.	W.D. (bpm)	Blows/ft. - in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. - bgs
14									14
15	4	0.0		4.5			SC		15
16									16
17		0.0							17
18									18
19									19
20	5	0.0		4.5					20
21									21
22		0.0							22
23									23
24					Red-brown CLAY with light gray mottling and less than 5% sand and fine gravel. Stiff to very stiff, and moist. No observed DNAPL stains or odors.		CL		24
25	6	0.0		4.0				Bottom of Outer Casing	25
26									26
27		0.0							27
28									28
29									29
30		2.2							30

Legend:

Silt: [diagonal lines]

Clay: [horizontal lines]

Sand: [dots]

Gravel: [cross-hatch]

Bedrock: [checkered]

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

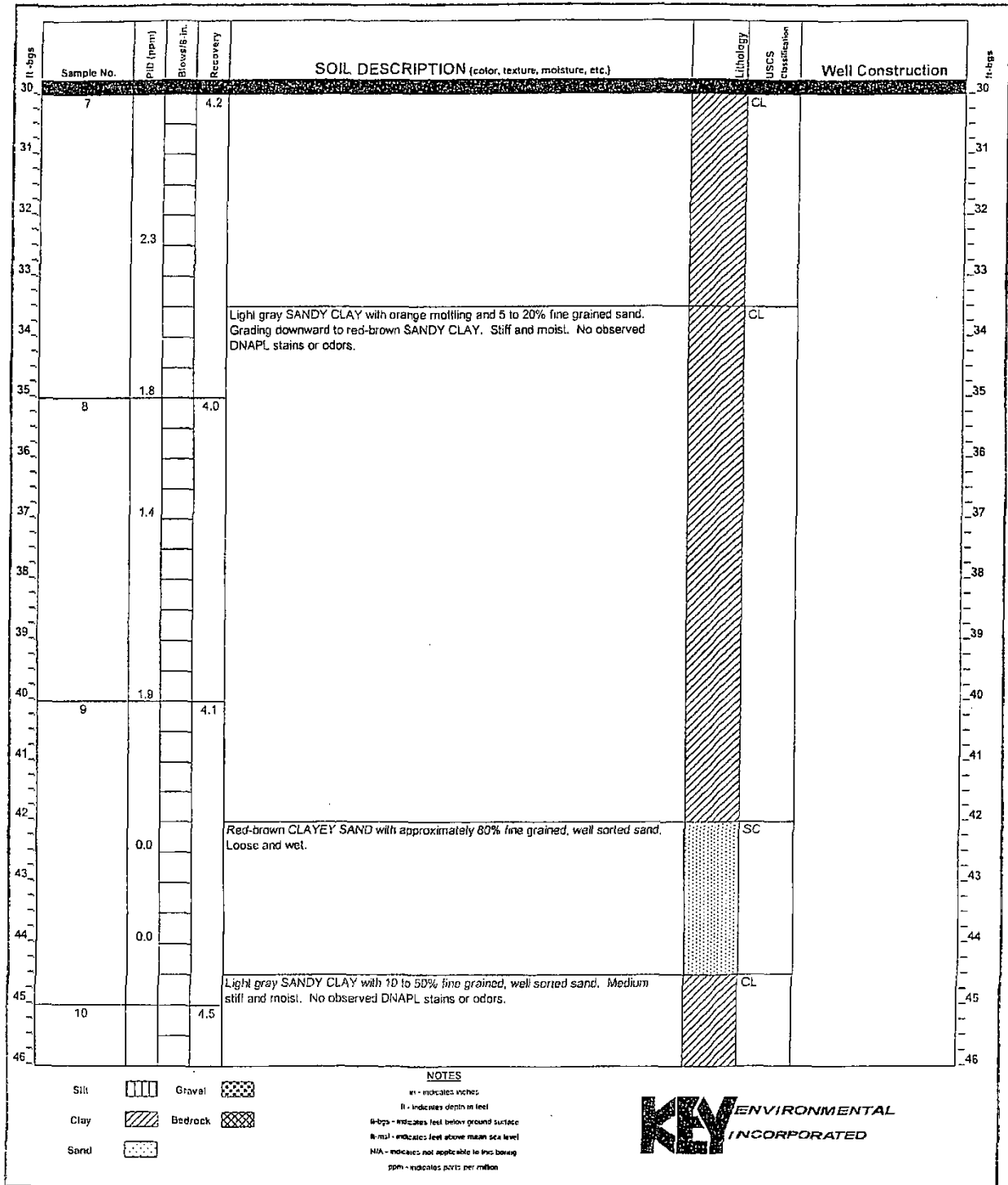
N/A - indicates not applicable in this boring

ppm - indicates parts per million

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LOG OF BORING: TW-2-1 (cont)

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LOG OF BORING: TW-2-1 (con't)

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ft. - bgs	Sample No.	PID (ppm)	Blow#s/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. - bgs
46									46
47									47
48		0.0							48
49									49
50	11	0.0			END OF BORING				50
51									51
52									52
53									53
54									54
55									55
56									56
57									57
58									58
59									59
60									60
61									61
62									62

Legend:

Silt		Gravel	
Clay		Bedrock	
Sand			

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

bpm - indicates parts per million

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LOG OF BORING: TW-3-1

Page 1 of 5

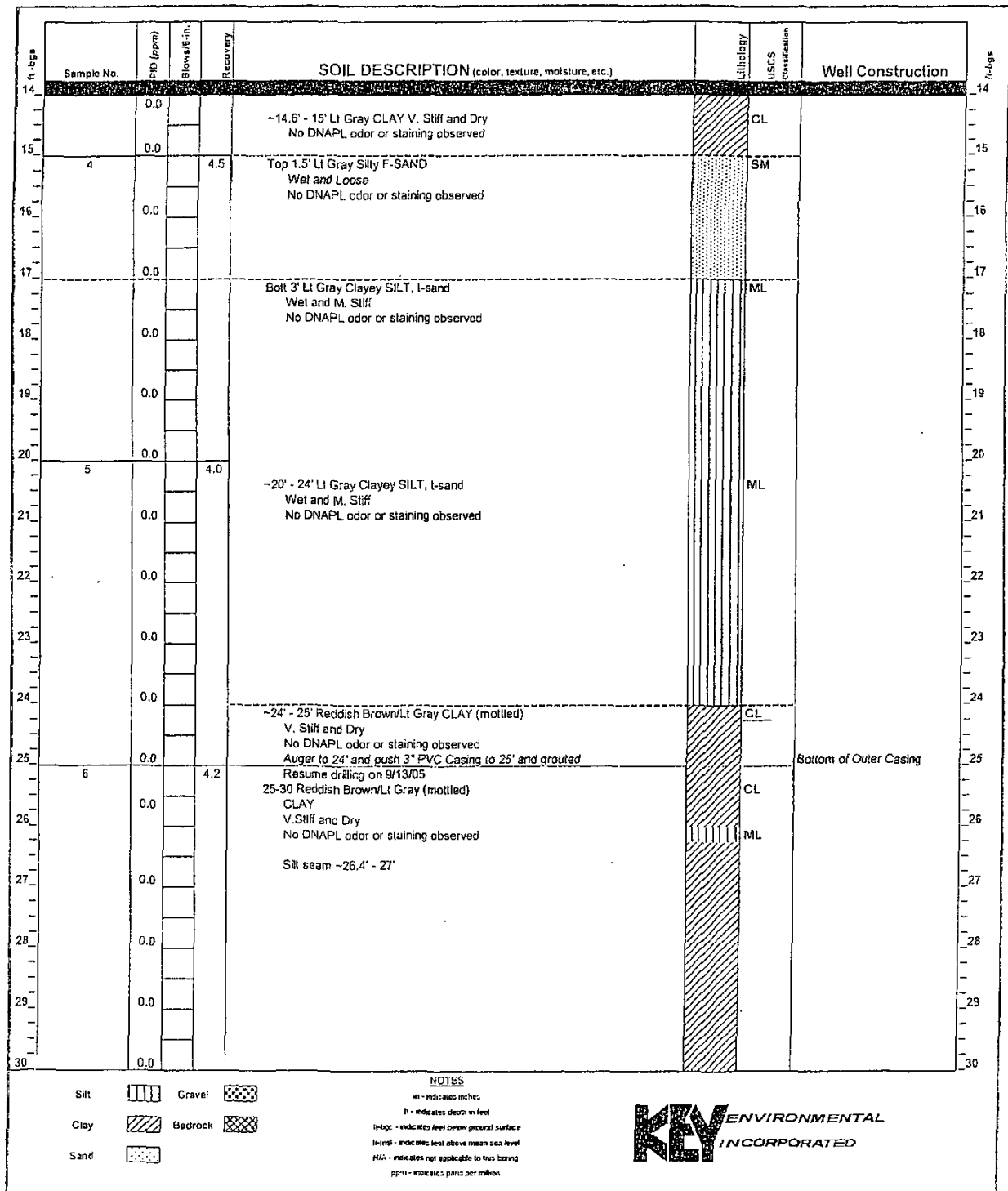
Client Name: BEAZER EAST		Drilling/Boring Method: Geoprobe		Total Boring Depth (ft): 65	
Project Number: 05-113		Sampling Method: 5' Split Spon		Ground Surface Elev. (ft-msl): 50.04	
Location: South Cavalcade: Houston, TX		Subcontractor/Drillers: Advanced Drilling Systems		Measuring Point Elev. (ft-msl): NA	
Date/Time Started: 9/12/2005		Monitoring Equipment: PID		Geologist/Engineer: Bob Balkovec	
Date/Time Completed: 9/14/2005		Coordinates: N733013.9 / E3158212.2		Consultant: KEY Environmental, Inc.	

Sample No.	PID (ppm)	Blow/ft-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Uthology	USCS Classification	Well Construction
1	0.0	3.8		Top 5' Topsoil No DNAPL odor or staining observed ~5' - 5' Lt Gray Clayey SILT Moist and M. Stiff No DNAPL odor or staining observed		ML	TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-25.0 1" PVC: riser 0-49' screen 49-64'
2	0.0	4.0		5' - 10' Lt Gray/Yellow Orange (mottled) Clayey SILT, trace f-sand Moist and M. Stiff No DNAPL odor or staining observed		ML	
3	0.0	3.2		Wet at 10' ~10' - 14.6' Lt Gray Silty F-SAND Wet and Loose No DNAPL odor or staining observed		SM	

<p>Silt: [Pattern]</p> <p>Clay: [Pattern]</p> <p>Sand: [Pattern]</p>	<p>Gravel: [Pattern]</p> <p>Bedrock: [Pattern]</p>	<p>NOTES</p> <p>in - indicates inches</p> <p>ft - indicates depth in feet</p> <p>ft-bgs - indicates feet below ground surface</p> <p>ft-msl - indicates feet above mean sea level</p> <p>N/A - indicates not applicable to this boring</p> <p>ppm - indicates parts per million</p>	<p>Signature of Field Supervisor: <i>Robert Balkovec</i></p> <p>Date: _____</p>
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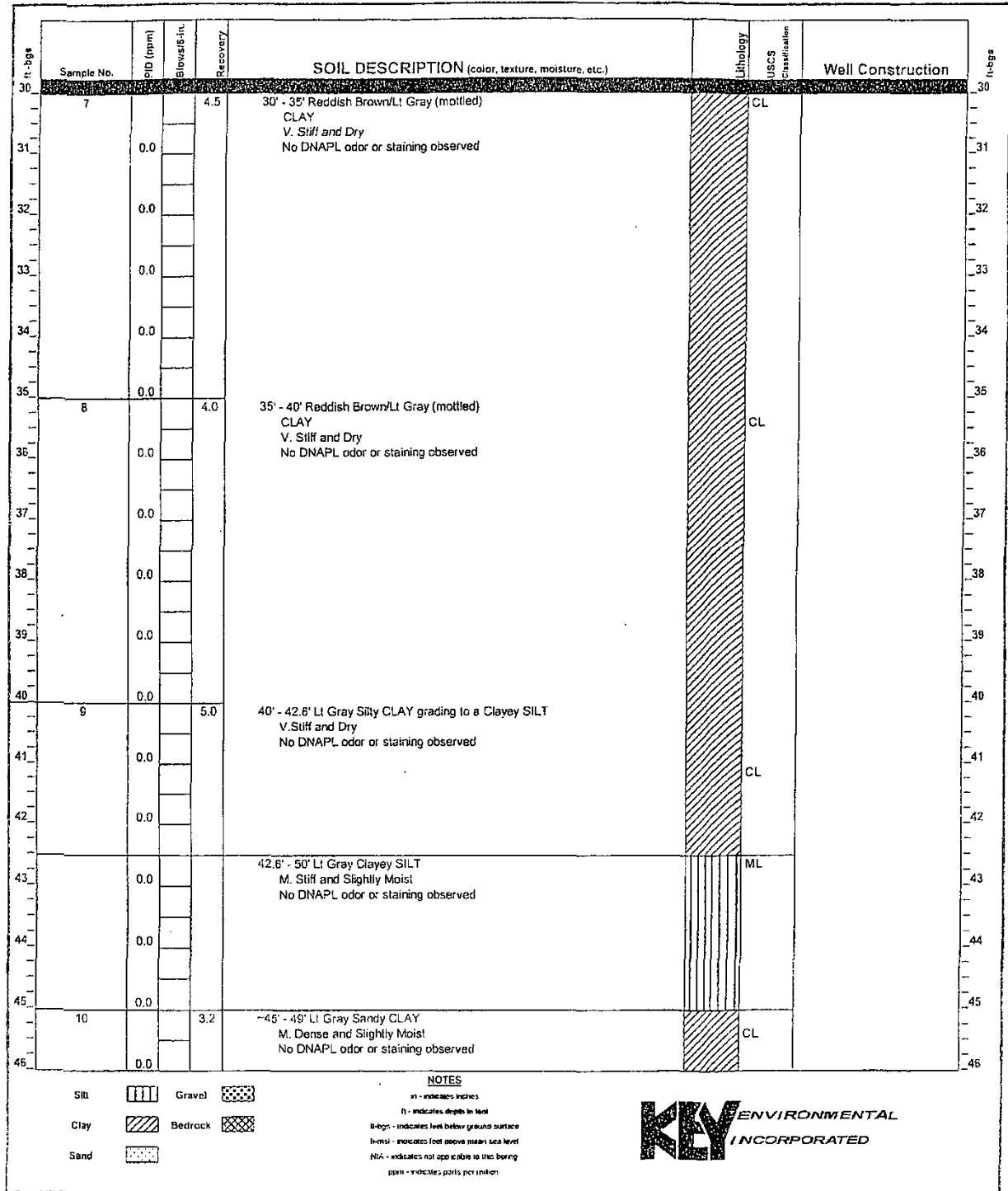
LOG OF BORING: TW-3-1 (cont)

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LOG OF BORING: TW-3-1 (con't)






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LOG OF BORING: TW-3-1 (cont)

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ft-bgs	Sample No.	MO (ppm)	Blowfall-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
46		0.0			~45' - 49' Lt Gray Sandy CLAY M. Dense and Slightly Moist No DNAPL odor or staining observed	CL			46
47		0.0							47
48		0.0							48
49		0.0			~49' - 50' Lt Gray Clayey SAND becoming more sandy with depth M. Dense and wet No DNAPL odor or staining observed	SC			49
50	11	0.0	3.9		Top 2.4' Lt Gray Clayey SAND becoming more sandy with depth V. Dense and wet No DNAPL odor or staining observed				50
51		0.0							51
52		0.0							52
53		0.0			Botl 1.5' Lt Gray F-SAND (little fines) M Dense and Moist No DNAPL odor or staining observed	SP			53
54		0.0							54
55	12	0.0	3.9		55' - 60' Lt Gray F-SAND (little fines) M Dense and Moist No DNAPL odor or staining observed	SP			55
56		0.0							56
57		0.0							57
58		0.0							58
59		0.0							59
60	13	0.0	4.5		~60' - 63.5' Lt Gray F-SAND (little fines) M Dense and Moist No DNAPL odor or staining observed	SP		Collected TOC from 63'-64' on 9/13/05 @ 0930	60
61		0.0							61
62		0.0							62


Silt  Gravel 
 Clay  Bedrock 
 Sand 

NOTES
 m - indicates inches
 ft - indicates depth in feet
 ft-bgs - indicates feet below ground surface
 ft-msl - indicates feet above mean sea level
 N/A - indicates not applicable to this boring
 ppm - indicates parts per million


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
LOG OF BORING: TW-3-1 (con't)


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ft-bgs	Sample No.	mo (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
63		0.0			~63.5 - 65' Reddish Brown/Lt Gray (mottled) CLAY M. Stiff and Dry No DNAPL odor or staining observed		CL		63
64		0.0			64				
65		0.0			65				
					Set well at 64' Screened from 49' - 64' Sand to 47' Bent to 40'				


Legend:

Silt 

Clay 

Sand 

Gravel 

Bedrock 

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

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LOG OF BORING: TW-3-2

Page 1 of 5

Client Name:	BEAZER EAST	Drilling/Boring Method:	Geoprobe	Total Boring Depth (ft):	65
Project Number:	05-113	Sampling Method:	5" Split Spon	Ground Surface Elev. (ft-msl):	50.58
Location:	South Cavalcade: Houston, TX	Subcontractor/Drillers:	Advanced Drilling Systems	Measuring Point Elev. (ft-msl):	NA
Date/Time Started:	9/12/2005	Monitoring Equipment:	PID	Geologist/Engineer:	Bob Balkovec
Date/Time Completed:	9/14/2005	Coordinates:	N733321.13 / E3158246.67	Consultant:	KEY Environmental, Inc.

Sample No.	MD (ppm)	Blow/ft-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1	0.0		2.3	Top 1' Topsoil and angular gravel Moist and M. Stiff No DNAPL odor or staining observed		SM	TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-25.0
	0.0						1" PVC: riser 0-44' screen 44-59'
	0.0						
	0.0			Bottom 1.3' Gray F-SAND and SILT Dry and M. Dense No DNAPL odor or staining observed		ML/SM	
	0.0						
2	0.0		4.2	Top 1' Lt Gray Clayey SILT Moist and M. Stiff No DNAPL odor or staining observed		ML	
	0.0						
	0.0			-6' - 7.8' Lt Gray F-Sandy SILT, t- clay Wet and M. Stiff No DNAPL odor or staining observed		ML	
	0.0						
	0.0			-7.8' - 8.2' Lt Gray Silty F-SAND M. Dense and Wet No DNAPL odor or staining observed		SM	
	0.0						
	0.0			-8.2' - 10' Yellow Orange/Lt Gray Silty CLAY M. Stiff and Wet No DNAPL odor or staining observed		CL	
3	0.0		4.0	Top 1' Yellow Orange/Lt Gray Silty CLAY Minor black mottling (looks natural) Moist and Stiff No DNAPL odor or staining observed		CL	
	0.0						
	0.0			Bottom 3' Lt GrayYellow Orange (mottled) Silty F-SAND Moist and M. Dense No DNAPL odor or staining observed		SM	
	0.0						

Silt: Gravel: Clay: Bedrock: Sand:

NOTES
ft - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-msl - indicates feet above mean sea level
N/A - indicates not applicable to this boring
ppm - indicates parts per million

Signature of Field Supervisor:
Date: _____

LOG OF BORING: TW-3-2 (con't)

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ft.-bgs	Sample No.	PID (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft.-bgs
14		0.0					SM		14
15	4	0.0	4.5		Lt Gray and Yellow Orange F-SAND, t-silt Wet and Loose No DNAPL odor or staining observed		SP		15
16		0.0							16
17		0.0							17
18		0.0							18
19		0.0							19
20	5	0.0	4.0		~20' - 24.5' Lt Gray and Yellow Orange F-SAND, t-silt Wet and Loose No DNAPL odor or staining observed		SP		20
21		0.0							21
22		0.0							22
23		0.0							23
24		0.0							24
25	6	0.0	4.5		~24.5' - 25' Reddish Brown/Lt Gray (mottled) CLAY (V. Stiff and Dry) No DNAPL odor or staining observed Auger to 24' and push 3" PVC Casing to 25' and grouted Resume Drilling on 9/13/05 25' - 30' Reddish Brown/Lt Gray (mottled) CLAY V. Stiff and Dry No DNAPL odor or staining observed Silt seam ~27-27.3' and 27.6'-28'		CL	Bottom of Outer Casing	25
26		0.0					CL		26
27		0.0							27
28		0.0							28
29		0.0							29
30		0.0							30

NOTES

in - indicates inches

ft. - indicates depth in feet

ft.-bgs - indicates feet below ground surface

ft.-bgs - indicates feet above mean sea level

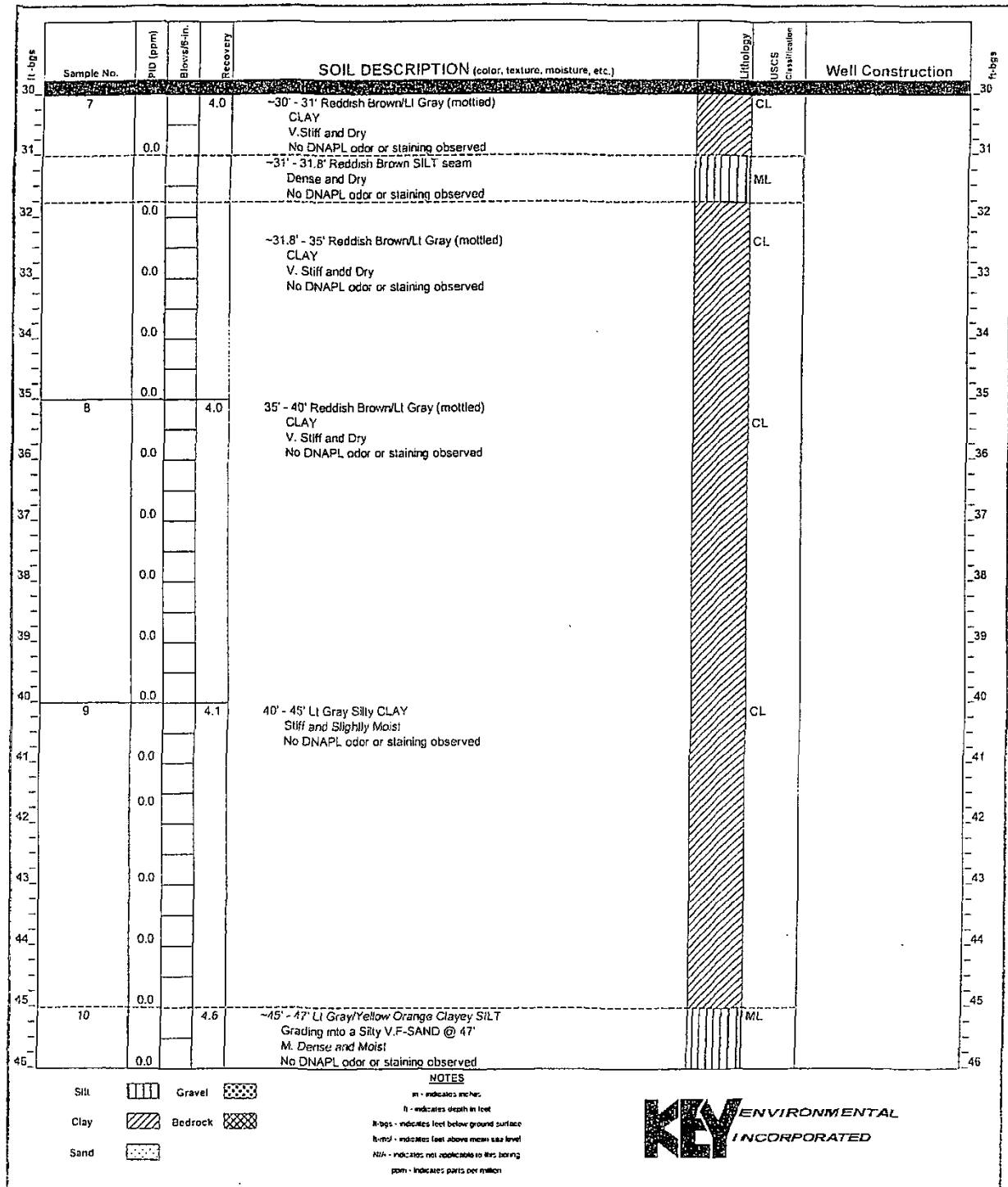
N/A - indicates not applicable to this boring

bls/ft. - indicates blows per foot

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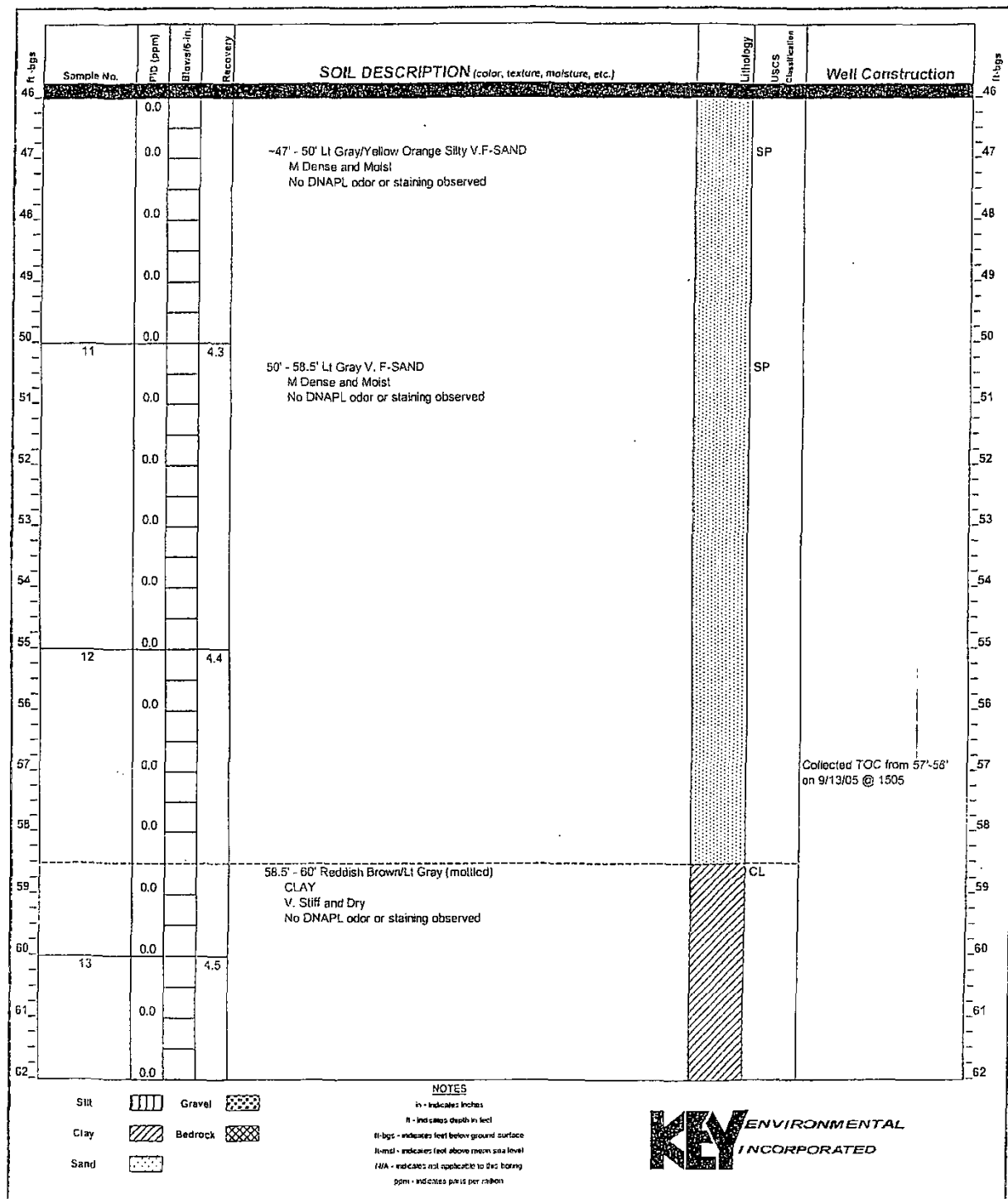
LOG OF BORING: TW-3-2 (con't)

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LOG OF BORING: TW-3-2 (con't)

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LOG OF BORING: TW-3-2 (con't)

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ft. bgs	Sample No.	PD (ppm)	Blews/ft. in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Urbology	USCS Classification	Well Construction	ft. bgs
63		0.0			-63.5' - 65' Reddish Brown/Lt Gray (mottled) CLAY M. Stiff and Dry No DNAPL odor or staining observed		CL		63
64		0.0							64
65		0.0			Set well at 59' Screened from 44' - 59' Sand to 42' Bent to 38'				65

Silt

Clay

Sand

Gravel

Bedrock

NOTES

in - indicates inches

ft - indicates feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

KEY ENVIRONMENTAL
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LOG OF BORING: TW-4-1

Page 1 of 4

Client Name: BEAZER EAST		Drilling/Boring Method: Geoprobe		Total Boring Depth (ft): 55	
Project Number: 05-113		Sampling Method: 5' Split Spon		Ground Surface Elev. (ft-msl): 50.18	
Location: South Cavalcade: Houston, TX		Subcontractor/Drillers: Advanced Drilling Systems		Measuring Point Elev. (ft-msl): NA	
Date/Time Started: 9/15/2005		Monitoring Equipment: PID		Geologist/Engineer: Bob Balkovec	
Date/Time Completed: 9/16/2005		Coordinates: N732717.5 / E3157610.61		Consultant: KEY Environmental, Inc.	

Sample No.	PD (ppm)	Blows/ft-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1	0.0	3.2		Dark to Lt Gray Silty F-SAND Soil looks reworked loose and moist No DNAPL odor or staining observed		SM	TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-20.0 1" PVC: riser 0-40' screen 40-55'
2	0.0	4.1		5-10 Lt Gray/Yellow Orange (mottled) Sandy CLAY w/ silt M Stiff and Moist No DNAPL odor or staining observed		CL	
3	0.0	3.7		Top .5 Lt Gray/Yellow Orange (mottled) Sandy CLAY w/ silt, M Stiff and Moist No DNAPL odor or staining observed		CL	
	0.0			-10.5-14 Lt Gray Silty F-SAND Loose and Wet No DNAPL odor or staining observed		SM	

<p>NOTES</p> <p>in - indicates inches</p> <p>ft - indicates depth in feet</p> <p>ft-bgs - indicates feet below ground surface</p> <p>bsmf - indicates feet above mean sea level</p> <p>N/A - indicates not applicable to this boring</p> <p>ppm - indicates parts per million</p>	<p>Signature of Field Supervisor</p> <p><i>Robert Balkovec</i></p>	<p>Date</p> <p>_____</p>
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LOG OF BORING: TW-4-1 (con't)


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Sample No.	PIU (ppm)	Blowrate (in.)	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
	0.0			~14 Reddish Brown/Li Gray CLAY (mottled) V. Stiff and Dry No DNAPL odor or staining observed		CL	
4	0.0	4.0		15' - 20' Reddish Brown/Li Gray CLAY (mottled) V. Stiff and Dry No DNAPL odor or staining observed			
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						
	0.0			Auger to 19' and push 3" PVC Casing to 20' and grout up			
5	0.0	3.7		Resume drilling on 9/16/05 20' - 25' Reddish Brown/Li Gray (mottled) CLAY V. Stiff and Dry No DNAPL odor or staining observed		CL	Bottom of Outer Casing
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						
6	0.0	4.3		25' - 30' Reddish Brown/Li Gray (mottled) CLAY Hard and Dry No DNAPL odor or staining observed		CL	
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						
	0.0						


NOTES


in - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-msl - indicates feet above mean sea level
N/A - indicates not applicable to test boring
perm - indicates permit number




Silt 

Clay 

Sand 

Gravel 

Bedrock 

LOG OF BORING: TW-4-1 (con't)

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ft-bgs	Sample No.	PID (ppm)	Blows/ft. in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
30	7		3.9		30' - 35' Reddish Brown/Lt Gray/Yellow Orange (mottled) CLAY Hard and Dry No DNAPL odor or staining observed		CL		30
31		0.0							31
32		0.0							32
33		0.0							33
34		0.0							34
35	8		4.7		~35' - 38' Reddish Brown/Lt Gray/Yellow Orange (mottled) CLAY Hard and Dry No DNAPL odor or staining observed		CL		35
36		0.0							36
37		0.0							37
38		0.0			~38' - 40' Lt Gray w/ Yellow Orange flecks CLAY V. Stiff and Slightly Moist No DNAPL odor or staining observed		CL		38
39		0.0							39
40	9		4.5		~40' - 41' Lt Gray w/ Yellow Orange flecks Silty CLAY becoming increasingly silty with depth V. Stiff and Dry No DNAPL odor or staining observed		CL		40
41	▼	0.0							41
42		0.0			~41' - 45' Lt Gray V. F-SAND some silt M. Dense and Wet No DNAPL odor or staining observed		SM		42
43		0.0							43
44		0.0							44
45	10		4.2		45' - 50' Lt Gray V.F-SAND some silt M. Dense and Moist No DNAPL odor or staining observed		SM		45
46	0								46

Silt

Clay

Sand

Gravel

Bedrock

NOTES

n - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-abd - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

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LOG OF BORING: TW-4-1 (cont)

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ft. bgs	Sample No.	PID (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. bgs
46		0.0			45' - 50' Lt Gray V.F-SAND some silt M. Dense and Moist No DNAPL odor or staining observed		SM		46
47		0.0							47
48		0.0							48
49		0.0							49
50	11	0.0	4.9		-50' - 54' Lt Gray Silty F-SAND (little fines) V. Dense and Moist No DNAPL odor or staining observed		SM		50
51		0.0							51
52		0.0			SAMPLED 51-53 @1100 for TOC				52
53		0.0							53
54		0.0			-54' - 55' Reddish Brown/Lt Gray CLAY (mottled) Hard and Dry No DNAPL odor or staining observed		CL		54
55		0.0							55
56					Set TW at 55' Screened 40-55 Sand to 35 Bent to 30				56
57									57
58									58
59									59
60									60
61									61
62									62

Legend:

Silt:

Clay:

Sand:

Gravel:

Bedrock:

NOTES

in - indicates inches

ft - indicates depth in feet

R-bgs - indicates feet below ground surface

h-met - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

KEY ENVIRONMENTAL
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LOG OF BORING: TW-4-2

Page 1 of 4

Client Name:	BEAZER EAST	Drilling/Boring Method:	Geoprobe	Total Boring Depth (ft):	55
Project Number:	05-113	Sampling Method:	5' Split Spon	Ground Surface Elev. (ft-msl):	50.14
Location:	South Cavalcade: Houston, TX	Subcontractor/Drillers:	Advanced Drilling Systems	Measuring Point Elev. (ft-msl):	
Date/Time Started:	9/15/2005	Monitoring Equipment:	PID	Geologist/Engineer:	Bob Balkovec
Date/Time Completed:	9/16/2005	Coordinates:	N732903.29 / E3157537.55	Consultant:	KEY Environmental, Inc.

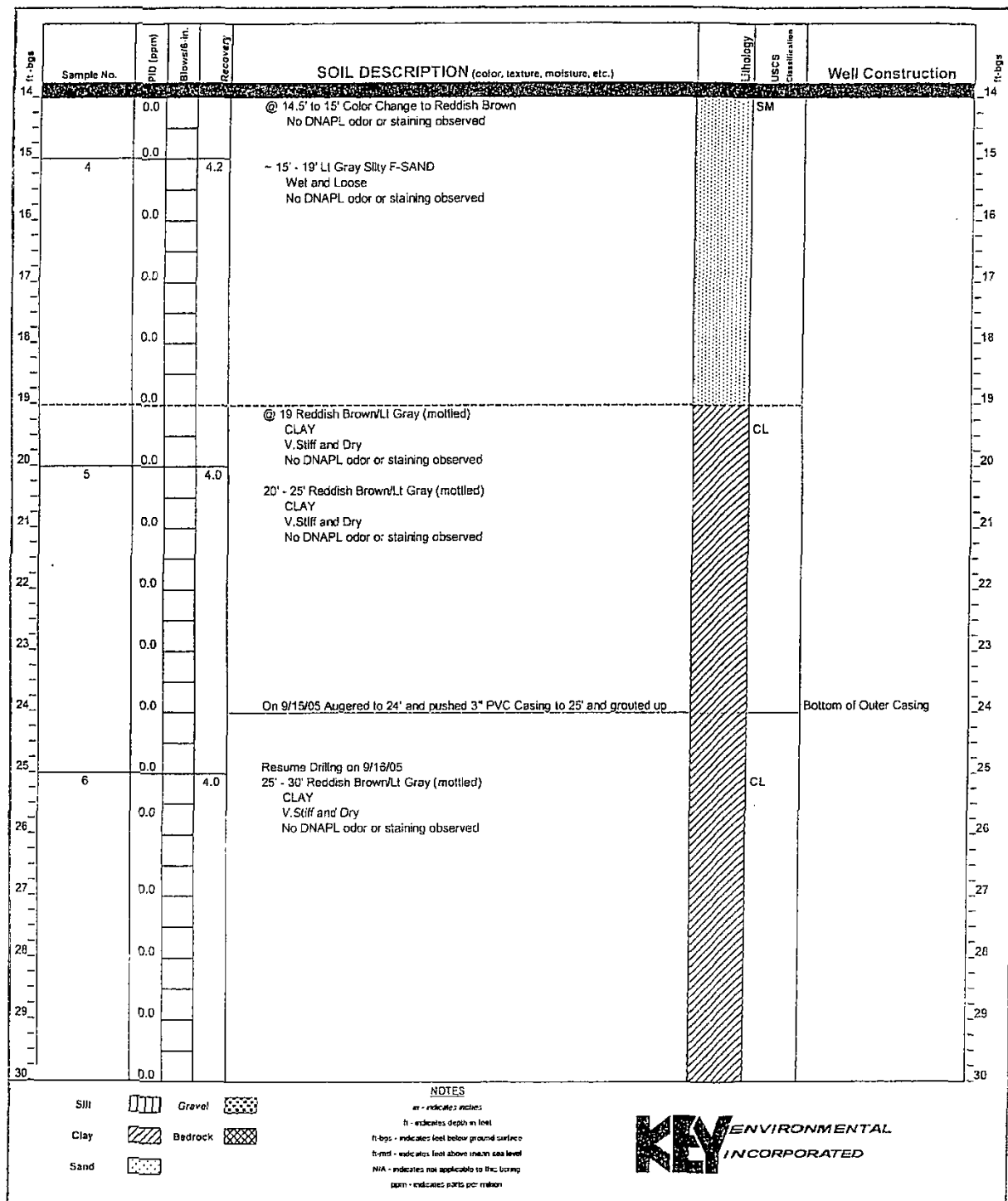
Sample No.	PID (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1	0.0	4.1		Dark to Lt Gray Silty F-SAND Soil looks reworked loose and moist No DNAPL odor or staining observed		SM	TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-25.0 1" PVC: riser 0-40' screen 40-55'
2	0.0	4.2		Top 1.3' Dark to Lt Gray Silty F-SAND Soil looks reworked loose and moist No DNAPL odor or staining observed		SM	
	0.0			Bottom 2.9' Lt Gray/Yellow Orange (mottled) Sandy CLAY w/ some silt M. Stiff and Moist No DNAPL odor or staining observed		CL	
3	0.0	4.5		Top 1' Lt Gray/Yellow Orange (mottled) Sandy CLAY w/ some silt M. Stiff and Moist No DNAPL odor or staining observed		CL	
	0.0			- 11' - 15' Lt Gray Silty F-SAND (little fines) Loose and Wet No DNAPL odor or staining observed		SM	

Silt	Gravel	
Clay	Bedrock	
Sand		

NOTES in - indicates inches; ft - indicates depth in feet; ft-bgs - indicates feet below ground surface ft-msl - indicates feet above mean sea level N/A - indicates not applicable to this boring perm - indicates permit number	Signature of Field Supervisor <i>Robert Balkovec</i>	Date _____
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LOG OF BORING: TW-4-2 (con't)

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LOG OF BORING: TW-4-2 (con't)

Page 3 of 4

ft-bgs	Sample No.	PIB (ppm)	Blows/ft	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
30	7			3.4	30' - 35' Reddish Brown/Lt Gray/Yellow Orange (mottled) CLAY Hard and Dry No DNAPL odor or staining observed		CL		30
31		0.0							31
32		0.0							32
33		0.0							33
34		0.0							34
35	8			5.0	35' - 38' Reddish Brown/Lt Gray/Yellow Orange (mottled) CLAY Hard and Dry No DNAPL odor or staining observed		CL		35
36		0.0							36
37		0.0							37
38		0.0			38' - 40' Lt Gray w/ Yellow Orange flecks Silty CLAY V. Stiff and Dry No DNAPL odor or staining observed				38
39		0.0							39
40	9			4.3	40' - 45' Lt Gray w/ Yellow Orange flecks Silty CLAY becoming increasingly silty with depth V. Stiff and Dry No DNAPL odor or staining observed		CL		40
41		0.0							41
42		0.0							42
43		0.0							43
44		0.0							44
45	10			4.2	45' - 50' Lt Gray F-SAND (little fines) V. Dense and Moist No DNAPL odor or staining observed		SM		45
46		0.0							46

Silt Gravel
 Clay Bedrock
 Sand

NOTES
 a1 - indicates axis
 ft - indicates depth in feet
 ft-bgs - indicates feet below ground surface
 ft-msl - indicates feet above mean sea level
 N/A - indicates not applicable to this boring
 ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED

LOG OF BORING: TW-4-2 (cont)






Page 4 of 4

ft - bgs	Sample No.	P.D. (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft - bgs
46					45' - 50' Lt Gray F-SAND (little fines) V. Dense and Moist No DNAPL odor or staining observed		SM		46
47		0.0							47
48		0.0							48
49		0.0							49
50	11	0.0	4.2		~50' - 54' Lt Gray F-SAND (little fines) V. Dense and Moist No DNAPL odor or staining observed		SM		50
51		0.0							51
52		0.0			SAMPLED 52-53 @1625 for TOC				52
53		0.0							53
54		0.0			~54' - 55' Reddish Brown/Lt Gray CLAY (mottled) Hard and Dry No DNAPL odor or staining observed		CL		54
55		0.0							55
56					Set TW at 55' Screened 40-55 Sand to 38 Bent to 34				56
57									57
58									58
59									59
60									60
61									61
62									62

NOTES

in - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-msl - indicates feet above mean sea level
N/A - indicates not applicable to this boring
ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED

Silt  Gravel 
Clay  Bedrock 
Sand 

LOG OF BORING: TW-5-1 (con't)

Page 2 of 2

ft. bgs	Sample No.	PIU (ppm)	Blows/ft. in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. bgs
14									14
15	4	0.0	4.5		15' - 18.9' Lt Gray Silty F-SAND Wet and Loose No DNAPL odor or staining observed	SM			15
16		0.0							16
17		0.0							17
18		0.0							18
19		0.0			~18.9' - 20' Redish Brown/Lt Gray (mottled) Silty CLAY (Moist and Stiff) No DNAPL odor or staining observed	CL			19
20	5	0.0	1.0		Redish Brown/Lt Gray (mottled) CLAY (Hard and Dry) No DNAPL odor or staining observed	CL			20
21		0.0							21
22		0.0							22
23		0.0							23
24		0.0							24
25		0.0			Set TW-5-1 at 20' Screend from 5' - 20' Sand to 3' Chips to surface				25
26									26
27									27
28									28
29									29
30									30

NOTES

in - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-bcd - indicates feet below mean sea level
N/A - indicates not applicable to this boring
ppm - indicates parts per million

KEY ENVIRONMENTAL INCORPORATED

Silt

Clay

Sand

Gravel

Bedrock



LOG OF BORING: TW-6-1

Page 1 of 4

Client Name: BEAZER EAST	Drilling/Boring Method: Direct push	Total Boring Depth (ft): 58.0
Project Number: 05-113	Sampling Method: Continuous split-spoon	Ground Surface Elev. (ft-msl): 49.48
Location: South Cavalcade: Houston, TX	Subcontractor/Drillers: Advanced Drilling Systems	Measuring Point Elev. (ft-msl): NA
Date/Time Started: 9/15/05 15:25	Monitoring Equipment: PID	Geologist/Engineer: P. Sorek
Date/Time Completed: 9/17/05 11:50	Coordinates: N731884.23 / E3157888.97	Consultant: KEY Environmental, Inc.

Sample No.	PID (ppm)	Blows/ft-In.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
				SEE BORING LOG FOR TW-6-2			TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-25.0 1" PVC: riser 0-52.75' screen 52.75-57.75'
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

NOTES

in - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-msl - indicates feet above mean sea level
N/A - indicates not applicable to this boring
ppm - indicates parts per million

Signature of Field Supervisor

Date

Silt

Clay

Sand

Gravel

Bedrock

LOG OF BORING: TW-6-1 (con't)

Page 2 of 4

ft. - bgs	Sample No.	PID (ppm)	Blow/ft. in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. - bgs
14									14
15									15
16									16
17									17
18									18
19									19
20									20
21									21
22									22
23									23
24									24
25	1		3.0		Red-brown CLAY with gray mottling. Stiff to very stiff, and moist. No observed DNAPL stains or odors.	CL		Bottom of Outer Casing	25
26									26
27									27
28									28
29									29
30		0.0							30

Legend:

Silt:

Clay:

Sand:

Gravel:

Bedrock:

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-absl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED

LOG OF BORING: TW-6-1 (con't)

Page 3 of 4

ft. bgs	Sample No.	PI (ppm)	Bleed (in.)	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. bgs
30	2			5.0	same as above		CL		30
31									31
32		0.0							32
33									33
34									34
35		0.0							35
36	3			4.1					36
37									37
38		0.0							38
39									39
40		0.0				40			
41	4			4.5				41	
42								42	
43		0.0						43	
44								44	
45		0.0						45	
46	5			4.0				46	

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

MVA - indicates not applicable to this boring

ppm - indicates parts per million

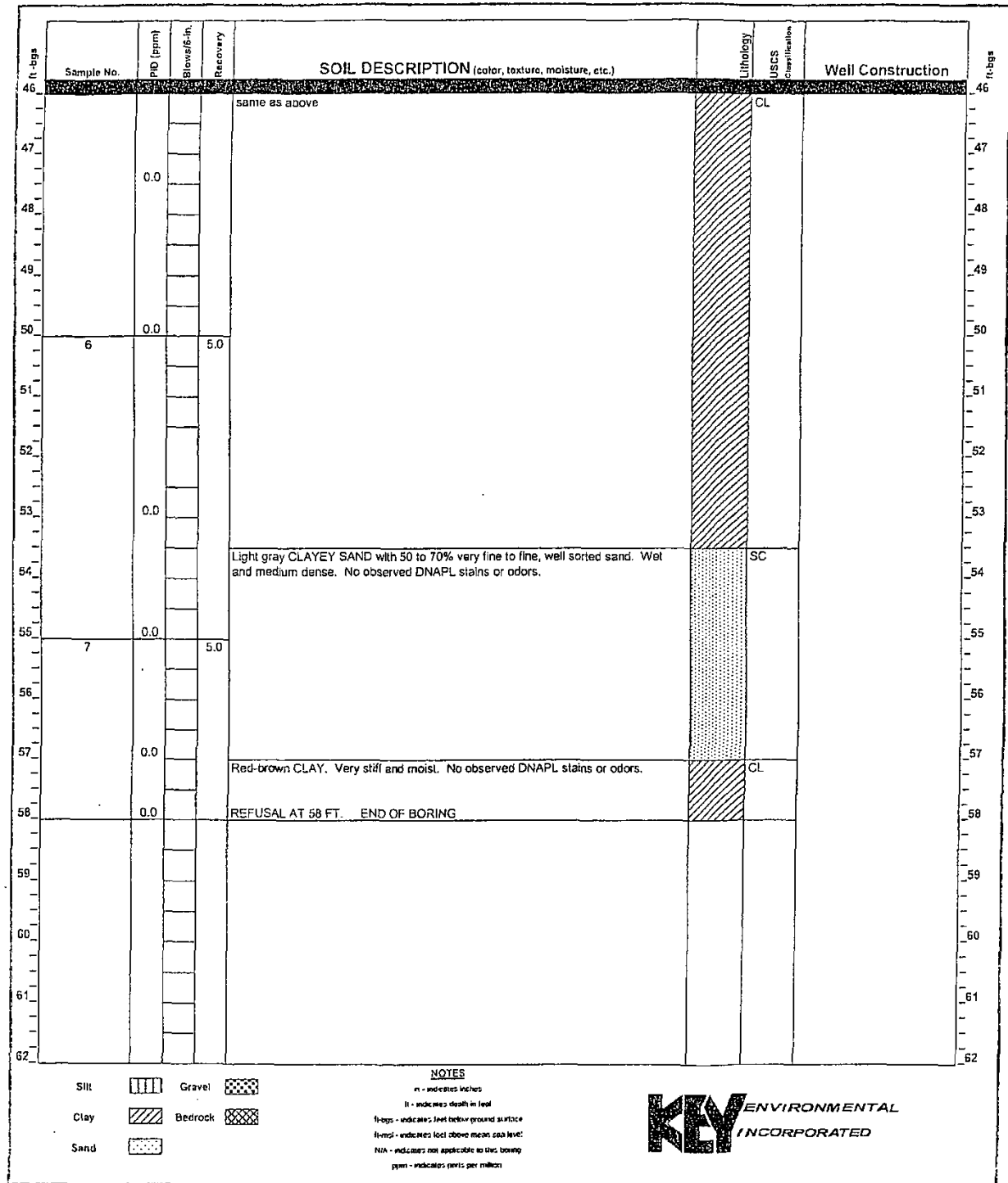
Silt
 Gravel

Clay
 Bedrock

Sand

LOG OF BORING: TW-6-1 (con't)

Page 4 of 4





LOG OF BORING: TW-6-2

Page 1 of 2

Client Name: BEAZER EAST	Drilling/Boring Method: Direct push	Total Boring Depth (ft): 20.0
Project Number: 05-113	Sampling Method: Continuous split-spoon	Ground Surface Elev. (ft-msl): 49.49
Location: South Cavalcade: Houston, TX	Subcontractor/Drillers: Advanced Drilling Systems	Measuring Point Elev. (ft-msl): NA
Date/Time Started: 9/15/05 14:10	Monitoring Equipment: PID	Geologist/Engineer: P. Sorek
Date/Time Completed: 9/15/05 14:50	Coordinates: N731877.92 / E3157889.27	Consultant: KEY Environmental, Inc.

Sample No.	PID (ppm)	Blows/ft	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1		5.0		Asphalt and road materials.			TEMPORARY WELL: 1" PVC: riser 0-7.75' screen 7.75-17.75'
				Black to dark gray SANDY GRAVELLY CLAY. Approximately 30% fine sand and approximately 5% fine gravel. Medium stiff and moist. Petroleum odor from 2 to 3'.	CL		
2	0.0	4.7		Light gray SANDY CLAY with approximately 30% fine grained sand, and orange mottling. Medium stiff and moist. No observed DNAPL stains or odors.			
	0.0			Very soft and wet interval from 7.8 to 8.5'.			
3	0.0	5.0		Grading downward to CLAYEY SAND with approximately 80% fine grained well sorted sand.	SC		

Silt Clay Sand	Gravel Bedrock	NOTES in - indicates inches ft - indicates depth in feet ft-bgs - indicates feet below ground surface ft-msl - indicates feet above mean sea level N/A - indicates not applicable to this boring ppm - indicates parts per million	Signature of Field Supervisor Date _____
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LOG OF BORING: TW-6-2 (cont)

Page 2 of 2

ft. - bgs	Sample No.	PID (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. - bgs
14					Red-brown and light gray CLAYEY SAND grading downward to red-brown CLAY with light gray mottling. Very stiff and moist. No observed DNAPL stains or odors.		SC		14
15	4		3.0						15
16									16
17		0.0					CL		17
18									18
19									19
20		0.0			END OF BORING				20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30

Legend:

Silt:

Clay:

Sand:

Gravel:

Bedrock:

NOTES

in - inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

LOG OF BORING: TW-7-1 (con't)

Page 2 of 4

Sample No.	PID (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
	0.0					SC	
4		4.5					
	0.0			Saturated from 17.1 to 17.5'. Red-brown and light gray CLAYEY SAND grading downward to red-brown CLAY. Medium stiff to stiff, and moist to wet.		SC/CL	
	0.0						
5		5.0		Red-brown CLAY with light gray mottling, and less than 5% sand and fine gravel. Very stiff and moist. No obvious DNAPL stains or odors.		CL	
6		2.3					Bottom of Outer Casing
	0.0						

NOTES

in - indicates inches


ft - indicates depth in feet

ft bgs - indicates feet below ground surface

ft msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million



LOG OF BORING: TW-7-1 (con't)

Page 3 of 4

ft-bgs	Sample No.	PID (ppm)	Blows/6 in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
30	7			5.0			CL		30
31									31
32		0.0							32
33									33
34									34
35	8	0.0		4.5			CL		35
36					Orange-brown and light gray SANDY CLAY with approximately 20% fine grained sand. Soft to medium stiff, and moist. No observed DNAPL odors or stains.				36
37		0.0							37
38									38
39									39
40	9	0.0		4.8	Yellowish-orange CLAYEY SAND with approximately 70% well sorted, fine grained sand. Loose to medium dense, and moist to wet. No observed DNAPL stains or odors.		SC		40
41									41
42		0.0							42
43					Red-brown CLAYEY SAND with 40 to 70% fine grained sand. Medium dense and moist. No observed DNAPL stains or odors.		SC		43
44									44
45	10	0.0		5.0					45
46									46

NOTES

in - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-msl - indicates feet above mean sea level
N/A - indicates not applicable to this boring
ppm - indicates parts per million

KEY ENVIRONMENTAL INCORPORATED

Silt: Gravel:
Clay: Bedrock:
Sand:

LOG OF BORING: TW-7-1 (cont)

Page 4 of 4

ft-bgs	Sample No.	PD (ppm)	Blows/ft-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
46							SC		46
47		0.0							47
48					Red-brown CLAY with light gray mottling. Stiff and moist. No observed DNAPL stains or odors.		CL		48
49									49
50		0.0			END OF BORING				50
51									51
52									52
53									53
54									54
55									55
56									56
57									57
58									58
59									59
60									60
61									61
62									62

Legend:

Silt:

Clay:

Sand:

Gravel:

Bedrock:

NOTES

in - indicates inches

ft - indicates depth in feet

ft bgs - indicates feet below ground surface

ft msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED



LOG OF BORING: TW-8-1

Page 1 of 4

Client Name: BEAZER EAST	Drilling/Boring Method: Direct push	Total Boring Depth (ft): 52.0
Project Number: 05-113	Sampling Method: Continuous split-spoon	Ground Surface Elev. (ft-msl) 48.90
Location: South Cavalcade: Houston, TX	Subcontractor/Drillers: Advanced Drilling Systems	Measuring Point Elev. (ft-msl) NA
Date/Time Started: 9/12/05 13:26	Monitoring Equipment: PID	Geologist/Engineer: P. Sorek
Date/Time Completed: 9/14/05 17:30	Coordinates: N731220.49 / E3157323.21	Consultant: KEY Environmental, Inc.

ft - bgs	Sample No.	PID (ppm)	Bleeds/ft	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft - bgs		
0	1			2.5	Light gray SILTY CLAY, with some orange and black mottling. Approximately 40% silt. Medium stiff, moist. No observed DNAPL stains or odors.		CL	TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-25.0' 1" PVC: riser 0-32.0' screen 32.0-52.0'	0		
1										1	
2		0.0								2	
3										3	
4										4	
5	2		0.0	3.0					5		
6									6		
7		0.0							7		
8									8		
9									9		
10	3	0.0		4.5	Light gray CLAYEY SILT with orange and black mottling, approximately 60% silt. Silt to medium stiff and moist. No observed DNAPL stains or odors.		ML		10		
11											11
12											12
13											13
14											14
					Silt and wet from 13.5 to 14.0'						

Legend:

Silt		Gravel	
Clay		Bedrock	
Sand			

NOTES

in - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-msl - indicates feet above mean sea level
N/A - indicates not applicable to this boring
ppm - indicates parts per million

Signature of Field Supervisor:

Date: _____

LOG OF BORING: TW-8-1 (con't)

Page 2 of 4

Sample No.	PID (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
				Light gray SILTY CLAY, medium stiff to stiff, and moist. No observed DNAPL stains or odors.		CL	
4	0.0	4.5		Buff to light gray CLAYEY SILT with occasional orange mottling, approximately 60% silt. No observed DNAPL stains or odors.		ML	
	0.0	0.0		very soft and saturated from 17.5' to 18.0'.			
				soft and wet from 18.0' to 19.0'.			
		0.0		Red-brown CLAYEY SILT, approximately 75% silt. Moist and medium stiff. No observed DNAPL stains or odors.		ML	
5		4.0		Red-brown to orange-brown CLAY with light gray mottling. Less than 5% silt, sand, and gravel. Stiff to very stiff, moist. No observed DNAPL stains or odors.		CL	
6		4.0					Bottom of Outer Casing

Legend:

Silt: [diagonal lines]

Clay: [horizontal lines]

Sand: [dots]

Gravel: [cross-hatch]

Bedrock: [wavy lines]

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bps - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring






ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED

LOG OF BORING: TW-8-1 (con't)

Page 3 of 4

ft-bgs	Sample No.	PID (ppm)	Blows/ft-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
30	7			4.5			CL		30
31									31
32		0.0							32
33									33
34									34
35		0.0			Buff to light gray fine grained SAND. Well sorted, loose, and moist. No observed DNAPL stains or odors.		SW		35
36	8			5.0					36
37		0.0							37
38									38
39					Light gray SILTY CLAY with orange mottling. Approximately 10-20% silt. Very stiff, and moist. No observed DNAPL stains or odors.		CL		39
40		0.0							40
41	9			5.0	Buff, fine grained SAND. Well sorted, loose, and moist. No observed DNAPL stains or odors.		SW		41
42									42
43		0.0							43
44					Light gray CLAYEY SILTY SAND grading downward to SILTY SAND. Medium dense, moist. No observed DNAPL stains or odors.		SM		44
45		0.0							45
46	10			5.0					46

Silt  Gravel 
 Clay  Bedrock 
 Sand 

NOTES

in - indicates inches
 ft - indicates depth in feet
 ft-bgs - indicates feet below ground surface
 ft-msl - indicates feet above mean sea level
 N/A - indicates not applicable to this boring
 ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED

LOG OF BORING: TW-8-1 (cont)

Page 4 of 4

ft. bgs	Sample No.	PIB (ppm)	Blow/ft. in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. bgs
46							SM		46
47		0.0							47
48									48
49									49
50	11	0.0		2.0					50
51									51
52					REFUSAL AT 52.0 FT, FLOWING SANDS				52
53									53
54									54
55									55
56									56
57									57
58									58
59									59
60									60
61									61
62									62

Silt Gravel
 Clay Bedrock
 Sand

NOTES
 vi - indicates inches
 ft - indicates depth in feet
 ft-bgs - indicates feet below ground surface
 ft-msl - indicates feet above mean sea level
 N/A - indicates not applicable to this boring
 ppm - indicates parts per million



LOG OF BORING: TW-9-1

Page 1 of 2

Client Name: BEAZER EAST	Drilling/Boring Method: Direct push	Total Boring Depth (ft): 25.0
Project Number: 05-113	Sampling Method: Continuous split-spoon	Ground Surface Elev. (ft-msl): 47.68
Location: South Cavalcade: Houston, TX	Subcontractor/Drillers: Advanced Drilling Systems	Measuring Point Elev. (ft-msl): NA
Date/Time Started: 9/14/05 9:55	Monitoring Equipment: PID	Geologist/Engineer: P. Sorek
Date/Time Completed: 9/14/05 12:00	Coordinates: N730801.31 / E3157309.121	Consultant: KEY Environmental, Inc.

Sample No.	PID (ppm)	Blows/ft-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1		5.0		Brown SANDY CLAY with 5-10% fine grained gravel. Stiff and moist.		CL	TEMPORARY WELL: 1" PVC: riser 0-9.0' screen 9.0-24.0'
				Light gray SILTY CLAY, medium stiff and moist. No observed DNAPL stains or odors.		CL	
2	0.0	5.0		Light gray SILTY CLAY with approximately 20% white weathered gravel. Medium stiff and moist. No observed DNAPL stains or odors.		CL	
	0.0						
3	0.0	5.0		Very soft and saturated from 11.8 to 12.5'.			
	0.0			Red-brown GRAVELLY CLAY with 0 to 50% white weathered fine gravel. Medium stiff and moist.		CL	

Legend:

Silt: [diagonal lines] Gravel: [checkered]

Clay: [horizontal lines] Bedrock: [cross-hatched]

Sand: [dots]

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

Signature of Field Supervisor: RISK

Date: _____

LOG OF BORING: TW-9-1 (con't)

Page 2 of 2

ft. bgs	Sample No.	PD (ppm)	Blows (5-in)	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. bgs
14									14
15	4		5.0		Light gray and red brown SILTY CLAY. Medium stiff and moist.		CL		15
16		0.0							16
17									17
18		0.0			Red brown CLAYEY SAND. Sand is very fine to fine grained and well sorted. Moist and medium dense. No observed DNAPL stains or odors.		SC		18
19									19
20	5		5.0						20
21		0.0							21
22									22
23					Red brown to light gray CLAY. Moist and stiff to very stiff. No observed DNAPL stains or odors.		CL		23
24		0.0							24
25					END OF BORING				25
26									26
27									27
28									28
29									29
30									30

Legend:

Silt:

Clay:

Sand:

Gravel:

Bedrock:

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million



LOG OF BORING: TW-9-2

Page 1 of 2

Client Name: BEAZER EAST	Drilling/Boring Method: Direct push	Total Boring Depth (ft): 20.0
Project Number: 05-113	Sampling Method: Continuous split-spoon	Ground Surface Elev. (ft-msl): 48.50
Location: South Cavalcade: Houston, TX	Subcontractor/Drillers: Advanced Drilling Systems	Measuring Point Elev. (ft-msl): NA
Date/Time Started: 9/13/05 16:10	Monitoring Equipment: PID	Geologist/Engineer: P. Sorek
Date/Time Completed: 9/13/05 16:55	Coordinates: N730862.55 / E3157295.93	Consultant: KEY Environmental, Inc.

Sample No.	PID (ppm)	Blows/ft-in.	recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1		5.0		Asphalt and poorly sorted sand and gravel.		GP	TEMPORARY WELL: 1" PVC: riser 0-13.5' screen 13.5-18.5'
	0.0			Light gray SANDY CLAY, with orange brown mottling, and approximately 20 to 40% fine sand. Stiff and moist. No observed DNAPL stains or odors.		CL	
2		3.5					
	0.0						
3		5.0					
	0.0						

SOIL Gravel Clay Bedrock Sand

NOTES
in - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-msl - indicates feet above mean sea level
N/A - indicates not applicable to this boring
ppm - indicates parts per million

Signature of Field Supervisor: RISK Date: _____

LOG OF BORING: TW-9-2 (cont)

Page 2 of 2

Sample No.	PID (ppm)	Blows/ft	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
	0.0						
4		5.0		Light gray CLAYEY SAND with approximately 75% fine grained, well sorted sand. Very soft and saturated. No observed DNAPL stains or odors.		SC	
	0.0			Red brown and light gray SILTY CLAY. Medium stiff to very stiff, and moist. No observed DNAPL stains or odors.		CL	
				END OF BORING			

Legend:

Silt: [diagonal lines]

Clay: [horizontal lines]

Sand: [dots]

Gravel: [cross-hatch]

Bedrock: [X-hatch]

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED



LOG OF BORING: TW-10-1

Page 1 of 4

Client Name:	BEAZER EAST	Drilling/Boring Method:	Direct push	Total Boring Depth (ft):	55.0
Project Number:	05-113	Sampling Method:	Continuous split-spoon	Ground Surface Elev. (ft-msl):	48.87
Location:	South Cavalcade: Houston, TX	Subcontractor/Drillers:	Advanced Drilling Systems	Measuring Point Elev. (ft-msl):	NA
Date/Time Started:	9/12/05 10:20	Monitoring Equipment:	PID	Geologist/Engineer:	P. Sorek
Date/Time Completed:	9/13/05 15:30	Coordinates:	N730290.40 / E3157325.30	Consultant:	KEY Environmental, Inc.

ft-bgs	Sample No.	PID (ppm)	Blow/s-ft	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
0								TEMPORARY WELL: 3" PVC outer casing grouted in place: 0-20.0'	0
1					SEE TW-10-2 LOG			1" PVC: riser 0-44.0' screen 44.0-54.0'	1
2									2
3									3
4									4
5									5
6									6
7									7
8									8
9									9
10									10
11									11
12									12
13									13
14									14

Silt		Gravel	
Clay		Bedrock	
Sand			

NOTES
 in - indicates inches
 ft - indicates depth in feet
 ft-bgs - indicates feet below ground surface
 ft-msl - indicates feet above mean sea level
 N/A - indicates not applicable to this boring
 ppm - indicates parts per million

Signature of Field Supervisor

Date

[Signature]

LOG OF BORING: TW-10-1 (con't)

Page 2 of 4

ft. - bgs	Sample No.	PLD (ppm)	Blows/ft. in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. - bgs
14					SEE TW-10-2				14
15									15
16									16
17									17
18									18
19									19
20	1			4.0	Red-brown CLAY with light gray mottling. Less than 5% silt, sand, and fine gravel. Very stiff, and moist. No observed DNAPL stains or odors.	CL		Bottom of Outer Casing	20
21									21
22		0.0							22
23									23
24									24
25	2	0.0		5.0					25
26									26
27									27
28		0.0							28
29									29
30		0.0							30

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bgs - indicates feet below ground surface

ft-absl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED

Silt

Clay

Sand

Gravel

Bedrock

LOG OF BORING: TW-10-1 (con't)

Page 3 of 4

ft - bgs	Sample No.	PID (ppm)	Blows/5-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft - bgs
30	3			5.0					30
31									31
32		0.0							32
33									33
34									34
35	4	0.0		5.0	Red-brown grading downward to orange-brown CLAY. Less than 5% silt, sand, and fine gravel. Stiff to very stiff, and moist. Occasional dry partings. No observed DNAPL stains or odors.		CL		35
36									36
37		0.0							37
38									38
39									39
40	5	0.0		5.0					40
41									41
42		0.0							42
43									43
44					Orange-brown to buff SILTY CLAY. Medium stiff, moist. No observed DNAPL stains or odors.		CL		44
45	6	0.0		5.0					45
46									46

NOTES

in - indicates inches


ft - indicates depth in feet


ft-bgs - indicates feet below ground surface


ft-msl - indicates feet above mean sea level


N/A - indicates not applicable to this boring


ppm - indicates parts per million




Silt 

Clay 

Sand 

Gravel 

Bedrock 

LOG OF BORING: TW-10-1 (cont)

Page 4 of 4

ft. - bgs	Sample No.	PI (ppm)	Blows/ft.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. - bgs
46									46
47		0.0			Buff CLAYEY SILT, soft, and moist. Wet interval from 47.25' to 47.75'. No observed DNAPL stains or odors.		ML		47
48									48
49									49
50	7	0.0	5.0						50
51									51
52		0.0							52
53									53
54					Wet parting at top of clay, 54'. Red-brown CLAY with gray, black, and orange mottling. Very stiff, and moist. No observed DNAPL stains or odors.		CL		54
55		0.0			END OF BORING				55
56									56
57									57
58									58
59									59
60									60
61									61
62									62

Silt		Gravel	
Clay		Bedrock	
Sand			

NOTES
 ft - indicates feet
 ft - bgs - indicates feet below ground surface
 ft - msl - indicates feet above mean sea level
 N/A - indicates not applicable to this boring
 ppm - indicates parts per million

KEY ENVIRONMENTAL
 INCORPORATED



LOG OF BORING: TW-10-2

Page 1 of 2

Client Name: BEAZER EAST	Drilling/Boring Method: Direct push	Total Boring Depth (ft): 20.0
Project Number: 05-113	Sampling Method: Continuous split-spoon	Ground Surface Elev. (ft-msl): 46.85
Location: South Cavalcade: Houston, TX	Subcontractor/Drillers: Advanced Drilling Systems	Measuring Point Elev. (ft-msl): NA
Date/Time Started: 9/12/05 8:50 am	Monitoring Equipment: PID	Geologist/Engineer: P. Sorek
Date/Time Completed: 9/12/05 10:15 am	Coordinates: N730289.91 / E3157320.43	Consultant: KEY Environmental, Inc.

ft-bgs	Sample No.	PID (ppm)	Blows/ft-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
0	1			3.0	No Recovery from 0-2'			TEMPORARY WELL: 1" PVC: riser 0-10.0 screen 10.0-20.0	0
1									1
2									2
3					Light gray GRAVELLY SAND with some fines. Poorly sorted, stiff, damp. No observed DNAPL stains or odors.	GW			3
4		0.0							4
5	2			4.5	Light gray SANDY GRAVELLY CLAY with orange mottling. Gravel is fine grained and angular, approximately 50%. Poorly sorted, medium stiff, and wet. No observed DNAPL staining or odors.	CL			5
6									6
7									7
8									8
9		0.0							9
10									10
11	3			4.0					11
12									12
13		0.0			Gray SILTY CLAY. Approximately 40% silt. Very soft and wet. No observed DNAPL stains or odors.	CL			13
14									14

Silt		Gravel	
Clay		Bedrock	
Sand			

NOTES
 m - indicates inches
 ft - indicates feet in feet
 ft-bgs - indicates feet below ground surface
 ft-msl - indicates feet above mean sea level
 N/A - indicates not applicable to this boring
 ppm - indicates parts per million

Signature of Field Supervisor

Date

P. Sorek

LOG OF BORING: TW-10-2 (con't)

Page 2 of 2

ft. - bgs	Sample No.	PID (ppm)	Blows/ft-in.	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft. - bgs
14					Light gray SILTY CLAY with orange mottling. Medium stiff, moist. No observed DNAPL stains or odors.		CL		14
15	4			4.0	Gray SILTY CLAY, very soft and saturated. No observed DNAPL stains or odors.		CL		15
16		0.0							16
17					Gray SILTY CLAY with red-orange mottling. Medium stiff and moist. No observed DNAPL stains or odors.		CL		17
18					Red-brown CLAY with some gravel (~5%). Dry to moist, medium stiff. No observed DNAPL stains or odors.		CL		18
19									19
20					END OF BORING				20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30

NOTES

in - indicates inches
ft - indicates depth in feet
ft-bgs - indicates feet below ground surface
ft-msl - indicates feet above mean sea level
N/A - indicates not applicable to this boring
ppm - indicates parts per million

Silt

Clay

Sand

Gravel

Bedrock

KEY ENVIRONMENTAL
INCORPORATED



LOG OF BORING: TW-11-1

Page 1 of 2

Client Name: BEAZER EAST	Drilling/Boring Method: Direct push	Total Boring Depth (ft): 25.0
Project Number: 05-113	Sampling Method: Continuous split-spoon	Ground Surface Elev. (ft-msl): 48.25
Location: South Cavalcade: Houston, TX	Subcontractor/Drillers: Advanced Drilling Systems	Measuring Point Elev. (ft-msl): NA
Date/Time Started: 9/14/05 7:30	Monitoring Equipment: PID	Geologist/Engineer: P. Sorek
Date/Time Completed: 9/14/05 9:05	Coordinates: N730370.77 / E3157900.01	Consultant: KEY Environmental, Inc.

Sample No.	PID (ppm)	Blows/ft	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction
1			5.0	Asphalt and road materials.			TEMPORARY WELL: 1" PVC: riser 0-12.2' screen 12.2'-22.2'
				Light to dark gray SILTY CLAY with orange mottling. Medium stiff to stiff, and moist. No observed DNAPL stains or odors.		CL	
2	0.0		4.1				
	0.0			Very soft and wet interval from 7.2 to 7.5'			
3	0.0		5.0	Black SILTY CLAY, very soft and moist. No observed DNAPL stains or odors.		CL	
	0.0			Light gray CLAYEY SILT with less than 5% fine grain sand. Soft to medium stiff and moist.		ML	
	0.0			Black SILTY CLAY, very soft and moist. No observed DNAPL stains or odors.		CL	

NOTES

in - indicates inches

ft - indicates depth in feet

ft-bss - indicates feet below ground surface

ft-msl - indicates feet above mean sea level

N/A - indicates not applicable to this boring

ppm - indicates parts per million

Signature of Field Supervisor

RISK

Date

Silt

Clay

Sand






Gravel

Bedrock

LOG OF BORING: TW-11-1 (con't)

Page 2 of 2

ft-bgs	Sample No.	PID (ppm)	Blows/ft	Recovery	SOIL DESCRIPTION (color, texture, moisture, etc.)	Lithology	USCS Classification	Well Construction	ft-bgs
14					Light gray CLAYEY SILT with less than 5% sand. Soft and moist. Saturated parting at 14.8'. No observed DNAPL stains or odors.		ML		14
15	4			5.0	Red brown and light gray CLAYEY SILT. Medium stiff and moist. No observed DNAPL stains or odors.		ML		15
16									16
17									17
18		0.0			Wet parting at 17.8'.				18
19		0.0			Wet parting at 19.5'.				19
20	5			5.0					20
21		0.0			Soft and saturated from 20.5 to 22.0'.				21
22					Red brown CLAY, very stiff and moist. No observed DNAPL stains or odors.		CL		22
23									23
24		0.0							24
25					END OF BORING				25
26									26
27									27
28									28
29									29
30									30

Silt  Gravel 
 Clay  Bedrock 
 Sand 

NOTES
 ft - indicates depth in feet
 ft-bgs - indicates feet below ground surface
 ft-msl - indicates feet above mean sea level
 N/A - indicates not applicable to this boring
 ppm - indicates parts per million

KEY ENVIRONMENTAL
INCORPORATED

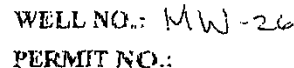
**APPENDIX B
GROUNDWATER SAMPLE COLLECTION RECORDS**

GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-25

PERMIT NO.:

[illegible]



Project No.: 05-113

Client: Beazer East

Project Name: South Cavalcade

Project Location: Houston, TX

Weather Conditions: SUNNY : 95°F

Sampling Date: 09/19/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: — (ft)

b. Depth to Water: 8.13 (ft)

c. Depth to DNAPL: — (ft)

d. Total Well Depth: 18.76 (ft)

e. LNAPL Thickness: (a-b) — (ft)

f. DNAPL Thickness: (c-d) — (ft)

g. Length of Water Column: 10.63 (ft)

h. Well Volume: 1.73 (gal)

2. WELL PURGE DATA

a. Purge Method: PERISTALTIC PUMP

b. Field Testing Equipment: Horiba U-22

c. Required Total Purge Volume (1f x 2c) (gals.): —

d. Total Volume and Number of Well Volumes Removed: ~ 2.5 Gal

e. Begin Purge Time: 15:00 End Purge Time: 15:30

Conversion Factors (a x cf = b)	
Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (± 10%)	pH (± 0.1)	Spec. Cond. (mS/cm ± 3%)	Eh/ORP (mV, ± 10mV)	Diss O2 (mg/L, ± 10%)	TURB (NTU, ± 10%)	Salinity ‰	TDS G/L	Water Level (ft)
INT	5	250	29.5	7.34	0.140	-118	5.45	0.0	—	—	8.57
1	10		28.7	7.30	0.136	-117	0.49	0.0	—	—	8.68
2	15		28.6	7.27	0.126	-178	0.00	0.0	—	—	8.84
3	20		29.0	7.41	0.115	-192	0.00	0.0	—	—	8.94
4	25		29.0	7.43	0.113	-197	0.00	0.0	—	—	9.00
5	30		29.0	7.43	0.112	-200	0.00	0.0	—	—	9.05
6	35	✓	28.8	7.45	0.112	-200	0.00	0.0	—	—	9.11

3. SAMPLE COLLECTION DATA

Sampling Method(s) & Equip: LOW FLOW PERISTALTIC PUMP

Sample I.D. (Name, Date, Time): MW-36; 09/19/05; 15:30

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

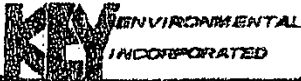
Sampling Personnel: R. TIPPET

Sample Start Time: 15:30 End Sample Time: —

PID/FID READING(s):

ODOR/SHEEN:

COMMENTS: ODOOR - PETROLEUM SMELL



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: OW-01

PERMIT NO.:

Project No.: 05-113

Client:

Beazer East

Project Name: South Cavalcade

Project Location: Houston, TX

Weather Conditions: SUNNY 90°F

Sampling Date: 09/20/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: _____ (ft) b. Depth to Water: 5.95 (ft)
c. Depth to DNAPL: _____ (ft) d. Total Well Depth: 17.09 (ft)
e. LNAPL Thickness: (a-b) _____ (ft) f. DNAPL Thickness: (c-d) _____ (ft)
g. Length of Water Column: 11.14 (ft) (e-d)
h. Well Volume: 1.82 (gal)

2. WELL PURGE DATA

a. Purge Method: LOW FLOW PERISTALTIC PUMP
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (If x 2c) (gals.): _____
d. Total Volume and Number of Well Volumes Removed: 23.5 GAL
e. Begin Purge Time: 09:35 End Purge Time: 10:05

Conversion Factors (a x cf = b)	
Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.476

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm, ±3%)	El/ORP (mV, ±10mV)	Dis O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
INT	5	300mL/min	24.2	10.82	55.5	-276	8.71	23.0	-	-	6.09
1		300mL/min	23.8	10.45	52.6	-307	0.59	10.2	-	-	6.10
2			24.2	10.36	52.4	-311	0.00	0.0	-	-	6.07
3			24.3	10.40	52.0	-318	0.00	0.0	-	-	6.07
4			24.2	10.46	51.7	-325	0.00	0.0	-	-	6.07
5			24.3	10.48	51.4	-329	0.00	0.0	-	-	6.07
6	✓	✓	24.3	10.52	51.1	-333	0.00	0.0	-	-	7.27
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

3. SAMPLE COLLECTION DATA

Sampling Personnel:

R. TIPPET

Sampling Method(s) & Equip: LOW FLOW PERISTALTIC PUMP

Sample I.D. (Name, Date, Time): OW-01 09/20/05 10:05

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 10:05

End Sample Time: _____

PID/FID READING(s):

PID/FID Model & Ionization Potential

ODOR/SHEEN:

COMMENTS:

WELL NO.: OW - 28
PERMIT NO.:

Project No.:	05-113	Client:	Beazer East
Project Name:	South Cavalcade	Project Location:	Houston, TX
Weather Conditions:	SUNNY : 105° F	Sampling Date:	09/18/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: _____ (ft) b. Depth to Water: 9.62 (ft)

c. Depth to DNAPL: _____ (ft) d. Total Well Depth: 16.60 (ft)

e. LNAPL Thickness: (a-b) _____ (ft) f. DNAPL Thickness: (c-d) _____ (ft)

g. Length of Water Column: 6.98 (ft) (a-d)

h. Well Volume: 1.14 (gal)

Conversion Factors

2. WELL PURGE DATA

a. Purge Method: LOW FLOW: PERISTALTIC PUMP
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (1f x 2c) (gals.):
d. Total Volume and Number of Well Volumes Removed: ~ 4.5 GAL
e. Begin Purge Time: 15:30 End Purge Time: 16:15

Conversion Factors (a x cf = h)	
Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (± 10%)	pH (± 0.1)	Spec. Cond. (, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
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PRE-PURGE VALUES

INT	5	Acorn	27.3	740	61.8	27	7.00	64.3	-	-	9.73
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PURGING VALUES

[illegible]

3. SAMPLE COLLECTION DATA

Sampling Personnel: R. D. DREY

Sampling Method(s) & Equip: LOW FLOW, PERISTALTIC PUMP

Sample I.D. (Name, Date, Time): 010-08' 09/18/05' 16.15

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 16:15

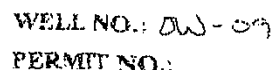
End SampleTime: 4.15

PID/FID READING(s) :

PID/FID Model & Ionization Potential

ODOR/SEEN:

COMMENTS: FD 2 TAKEN





GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: P-01
PERMIT NO.:

Project No.: 05-113 Client: Beazer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: Sunny 90°F Sampling Date: 04/18/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: (ft) b. Depth to Water: 19.48 (ft)
c. Depth to DNAPL: (ft) d. Total Well Depth: 49.49 (ft)
e. LNAPL Thickness: (a-b) (ft) f. DNAPL Thickness: (c-d) (ft)
g. Length of Water Column: 30.01 (ft) (a-d)
h. Well Volume: 4.89 (gal)

Conversion Factors (a x cf = b)	
Well ID	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

2. WELL PURGE DATA

a. Purge Method: Low Flow Peristaltic Pump
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (1f x 2c) (gals.):
d. Total Volume and Number of Well Volumes Removed: 4.56 gal
e. Begin Purge Time: 09:30 End Purge Time: 10:40

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
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PRE-PURGE VALUES

INT	5	300ml/min	24.4	7.85	0.106	-32	4.16	554	—	—	20.63
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PURGING VALUES

1			24.4	7.90	83.2	-9	1.09	154	—	—	22.45
2			24.5	8.03	66.8	-43	1.28	75.4	—	—	23.79
3			24.7	8.20	54.3	-11	2.06	148	—	—	24.73
4			25.1	8.13	57.3	10	1.92	39.5	—	—	25.59
5			25.3	8.05	63.1	19	1.53	49.4	—	—	26.18
6			25.3	8.01	68.3	25	1.42	41.0	—	—	26.61
7			25.7	7.98	73.4	28	0.92	36.7	—	—	26.98
8			26.0	7.96	78.3	31	0.73	23.6	—	—	27.25
9			26.2	7.93	80.1	33	0.70	31.5	—	—	27.44
10			26.5	7.92	86.0	34	0.33	32.6	—	—	27.59
11			26.8	7.90	89.5	35	0.26	27.1	—	—	27.68
12			26.4	7.88	90.1	36	0.60	28.2	—	—	27.74
13			26.7	7.85	90.4	37	0.00	27.4	—	—	27.80
14	✓	✓	26.5	7.84	90.2	37	0.00	27.8	—	—	27.83

3. SAMPLE COLLECTION DATA

Sampling Personnel: R. Tippet

Sampling Method(s) & Equip: Low Flow Peristaltic Pump

Sample I.D. (Name, Date, Time): P-01, 04/18/05, 10:40

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 10:40

End Sample Time: —

PID/FID READING(s):

PID/FID Model & Ionization Potential

ODOR/SHEEN:

COMMENTS: MS/MSD TAKEN



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: P-02R
PERMIT NO.:

Project No.: 05-113		Client: Beazer East													
Project Name: South Cavalcade		Project Location: Houston, TX													
Weather Conditions: Sunny: 95°F		Sampling Date: 09/19/05													
1. WATER LEVEL DATA (measured from top of inner well casing)															
a. Depth to LNAPL: _____ (ft)	b. Depth to Water: 116.34 (ft)														
c. Depth to DNAPL: _____ (ft)	d. Total Well Depth: 49.52 (ft)														
e. LNAPL Thickness: (a-b) _____ (ft)	f. DNAPL Thickness: (c-d) _____ (ft)														
g. Length of Water Column: 33.18 (ft)	(a-d)														
h. Well Volume: 5.41 (gal)															
2. WELL PURGE DATA		<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = b)</th></tr><tr><th>Well I.D.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>1</td><td>0.041</td></tr><tr><td>2</td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>		Conversion Factors (a x cf = b)		Well I.D.	Conv. Fact. (cf)	1	0.041	2	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = b)															
Well I.D.	Conv. Fact. (cf)														
1	0.041														
2	0.163														
4	0.653														
6	1.470														
a. Purge Method: Low Flow Peristaltic Pump															
b. Field Testing Equipment: Horiba U-22															
c. Required Total Purge Volume (1f x 2c) (gals.): _____															
d. Total Volume and Number of Well Volumes Removed: 24 GAL															
e. Begin Purge Time: 12:15	End Purge Time: 12:50														
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)				
PRE-PURGE VALUES															
INT 5	30 min		28.0	9.41	0.139	-190	11.03	38.6	—	—	16.85				
PURGING VALUES															
1			27.2	9.07	0.136	-257	2.86	37.3	—	—	16.88				
2			26.9	7.79	0.134	-208	0.31	14.5	—	—	16.91				
3			27.0	7.52	0.132	-187	0.00	0.0	—	—	16.91				
4			27.0	7.34	0.131	-181	0.00	0.0	—	—	16.92				
5			27.1	7.19	0.130	-174	0.00	0.0	—	—	16.92				
6			26.9	7.18	0.129	-174	0.00	0.0	—	—	16.93				
7	✓	✓	27.0	7.20	0.129	-175	0.00	0.0	—	—	16.93				
3. SAMPLE COLLECTION DATA															
Sampling Method(s) & Equip: Low Flow Peristaltic Pump						Sampling Personnel: R. TIPPET									
Sample I.D. (Name, Date, Time): P-02R, 09/19/05, 12:50															
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B															
Sample Start Time: 12:50						End Sample Time: _____									
PID/FID READING(s):						PID/FID Model & Ionization Potential									
ODOR/SHEEN:															
COMMENTS:															



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: P-03R

PERMIT NO.:

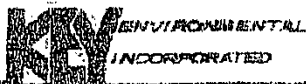
Project No.: 05-113		Client: Beazer East									
Project Name: South Cavalcade		Project Location: Houston, TX									
Weather Conditions: 80° - Humid		Sampling Date: 9/30/05									
1. WATER LEVEL DATA (measured from top of inner well casing)											
a. Depth to LNAPL: -	(ft)	b. Depth to Water: 38.65	(ft)								
c. Depth to DNAPL: -	(ft)	d. Total Well Depth: 64.84	(ft)								
e. LNAPL Thickness: (a-b)	(ft)	f. DNAPL Thickness: (c-d)	(ft)								
g. Length of Water Column: 36.19	(ft)	(a-d)									
h. Well Volume: ~5.9	(gal)										
2. WELL PURGE DATA		Conversion Factors (a x cf = b)									
a. Purge Method: Low Flow - Slotted Pump		Well ID.	Conv. Fact. (cf)								
b. Field Testing Equipment: Horiba U-22		1	0.041								
c. Required Total Purge Volume (1f x 2c) (gals.): -		2	0.163								
d. Total Volume and Number of Well Volumes Removed: 21 gals		4	0.653								
e. Begin Purge Time: 0815	End Purge Time: 0855	6	1.470								
Read No.	Lapse Time (min.)	Purge Rate (gpm)	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
PRE-PURGE VALUES											
1	0830	700	25.4	11.57	0.165	+16	9.62	32.7	0.1	-	39.80
PURGING VALUES											
2	0835	200	25.2	11.63	0.169	-5	8.52	25.1	0.1	-	39.90
3	0830	100	25.2	11.63	0.164	-14	8.31	32.7	0.1	-	39.01
4	0835	100	25.2	11.63	0.169	-21	8.20	47.5	0.1	-	39.03
5	0840	100	25.2	11.63	0.168	-24	8.10	47.1	0.1	-	39.00
6	0845	100	25.2	11.63	0.168	-27	8.08	47.5	0.1	-	39.00
7	0850	60	25.1	11.63	0.167	-31	8.11	48.1	0.1	-	39.00
8	0855	100	25.1	11.63	0.167	-32	8.01	48.0	0.1	-	39.00
END PURGE											
3. SAMPLE COLLECTION DATA											
Sampling Method(s) & Equip: Backup Pump											
Sample I.D. (Name, Date, Time): P-03R / 9/30/05 / 0900											
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B											
Sample Start Time: 0900											
End Sample Time: 0915											
PID/FID READING(s): -											
PID/FID Model & Ionization Potential											
ODOR/SHEEN:											
COMMENTS:											



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: P-04
PERMIT NO.:

Project No.: <u>05-113</u>		Client: <u>Beazer East</u>													
Project Name: <u>South Cavalcade</u>		Project Location: <u>Houston, TX</u>													
Weather Conditions: <u>SWANNY: 80°F</u>		Sampling Date: <u>09/18/05</u>													
1. WATER LEVEL DATA (measured from top of inner well casing)															
a. Depth to LNAPL: <u>—</u> (ft)	b. Depth to Water: <u>20.28</u> (ft)														
c. Depth to DNAPL: <u>—</u> (ft)	d. Total Well Depth: <u>33.74</u> (ft)														
e. LNAPL Thickness: (a-b) <u>—</u> (ft)	f. DNAPL Thickness: (c-d) <u>—</u> (ft)														
g. Length of Water Column: <u>33.46</u> (ft)	(a-d)														
h. Well Volume: <u>5.45</u> (gal)															
2. WELL PURGE DATA															
a. Purge Method: <u>LOW FLOW: PERISTALTIC PUMP</u>															
b. Field Testing Equipment: <u>Horiba U-22</u>															
c. Required Total Purge Volume (1f x 2c) (gals.): <u>—</u>															
d. Total Volume and Number of Well Volumes Removed: <u>= 4 GAL</u>															
e. Begin Purge Time: <u>07:55</u> End Purge Time: <u>08:35</u>															
<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = b)</th></tr><tr><th>Well I.D.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>1</td><td>0.041</td></tr><tr><td><u>2</u></td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>				Conversion Factors (a x cf = b)		Well I.D.	Conv. Fact. (cf)	1	0.041	<u>2</u>	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = b)															
Well I.D.	Conv. Fact. (cf)														
1	0.041														
<u>2</u>	0.163														
4	0.653														
6	1.470														
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)				
PRE-PURGE VALUES															
INT 5	20 min	26.4	7.76	76.1	19	5.87	5.7	—	—	20.68					
PURGING VALUES															
1			26.0	8.99	74.6	31	3.46	18.6	—	—	20.74				
2			25.9	9.02	75.4	39	2.51	45.3	—	—	20.74				
3			26.0	8.08	93.9	41	0.36	17.7	—	—	20.76				
4			26.0	7.87	0.103	-18	0.00	16.9	—	—	20.77				
5			26.0	7.84	0.105	-56	0.00	16.5	—	—	20.76				
6			26.0	7.83	0.105	-70	0.00	16.5	—	—	20.78				
7			26.0	7.81	0.107	-68	0.00	16.6	—	—	20.78				
8	✓	✓	26.1	7.78	0.107	-62	0.00	15.9	—	—	20.78				
3. SAMPLE COLLECTION DATA															
Sampling Method(s) & Equip: <u>LOW FLOW: PERISTALTIC PUMP</u>						Sampling Personnel: <u>R. TUPRET</u>									
Sample I.D. (Name, Date, Time): <u>P-04, 09/18/05, 08:35</u>															
Sample Analytical Parameters/Method: <u>Benzene and Naphthalene via EPA Method 8260B</u>															
Sample Start Time: <u>08:35</u>						End Sample Time: <u>—</u>									
PID/FID READING(s):						PID/FID Model & Ionization Potential									
ODOR/SHEEN:															
COMMENTS: <u>FD TAKEN</u>															



GROUNDWATER SAMPLE WELL NO.: P-05
COLLECTION RECORD PERMIT NO.: 1072

Project No.: 05-113 Client: Benzer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: Overcast: 80°F Sampling Date: 09/20/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: _____ (ft) b. Depth to Water: 9.52 (ft)
c. Depth to DNAPL: _____ (ft) d. Total Well Depth: 50.31 (ft)
e. LNAPL Thickness: (a-b) _____ (ft) f. DNAPL Thickness: (c-d) _____ (ft)
g. Length of Water Column: 41.19 (ft) (a-d)
h. Well Volume: 6.71 (gal)

2. WELL PURGE DATA

a. Purge Method: Low Flow Peristaltic Pump/Bladder Pump
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (If x 2c) (gals.): _____
d. Total Volume and Number of Well Volumes Removed: 2.24 x 100 = 224
e. Begin Purge Time: 07:50 End Purge Time: 11:00

Conversion Factors (a x c = b)	
Well I.D.	Conv. Fact. (ct)
1	0.041
2	0.163
4	0.653
6	1.470

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (±3%)	Ek/ORP (mV, ±10mV)	Diss O ₂ (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
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INT	5	0.00	24.1	14.05	0.433	-141	1.56	39.2	-	-	10.95
1			24.2	13.98	0.436	-158	0.17	27.2	-	-	12.94
2			24.3	13.90	0.435	-155	0.00	22.3	-	-	14.30
3			24.4	13.89	0.434	-154	0.00	4.9	-	-	15.56
4			24.6	14.05	0.434	-161	0.00	8.6	-	-	16.59
5			24.7	14.22	0.433	-169	0.00	3.4	-	-	17.94
6			24.7	14.31	0.431	-172	0.00	3.6	-	-	19.40
7			24.7	14.32	0.430	-172	0.00	5.4	-	-	20.51
8			24.9	14.30	0.428	-170	0.00	2.6	-	-	21.60
9			25.2	14.27	0.422	-167	0.00	0.0	-	-	22.50
10			25.0	14.27	0.415	-167	0.00	5.1	-	-	23.65
11			25.2	14.28	0.400	-164	0.00	2.4	-	-	24.76
12			25.4	14.23	0.383	-164	0.00	1.9	-	-	25.69
13			25.7	14.19	0.362	-163	0.00	0.0	-	-	26.47
14			26.2	14.11	0.325	-142	0.00	0.0	-	-	27.27

3. SAMPLE COLLECTION DATA

Sampling Personnel: R. TROTT

Sampling Method(s) & Equip: Low Flow Peristaltic Pump/Bladder

Sample I.D. (Name, Date, Time): P-05, 09/20/05, 11:00

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: _____

End Sample Time: _____

PID/FID READING(s): _____

PID/FID Model & Ionization Potential

ODORS/SMELL: _____

COMMENTS: Turbidity increased with flow rate. No odor detected.



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: P-05PERMIT NO.: 20P2

Project No.: 05-113 Client: Beazer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: _____ Sampling Date: 9/20/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: _____ (ft) b. Depth to Water: _____ (ft)
c. Depth to DNAPL: _____ (ft) d. Total Well Depth: _____ (ft)
e. LNAPL Thickness: (a-b) _____ (ft) f. DNAPL Thickness: (c-d) _____ (ft)
g. Length of Water Column: _____ (ft) (a-d)
h. Well Volume: _____ (gal)

Conversion Factors (a x cf = h)

Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

2. WELL PURGE DATA

a. Purge Method: BUDDER PUMP
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (1f x 2c) (gals.): _____
d. Total Volume and Number of Well Volumes Removed: 23 gal
e. Begin Purge Time: 11:30 End Purge Time: 11:40

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
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PURGE VALUES

15	10:25	100%	79.5	12.25	0.471	-150	3.00	71.1	0.2	-	27.32
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PURGING VALUES

16	10:30	100%	79.5	12.25	0.418	-140	2.17	68.3	0.2	-	28.30
17	10:35	50	76.1	12.14	0.414	-153	1.93	69.8	0.2	-	28.32
18	10:40	50	76.4	12.16	0.410	-155	2.00	71.4	0.2	-	28.34
19	10:45	50	76.5	12.14	0.417	-158	2.24	69.7	0.2	-	28.40
20	10:50	50	76.7	12.20	0.412	-155	2.35	71.4	0.2	-	28.38
21	10:55	50	76.8	12.22	0.414	-160	2.34	72.3	0.2	-	28.00
22	11:00	50	76.8	12.25	0.414	-161	2.35	75.1	0.2	-	31.01
23	11:05	50	77.0	12.25	0.414	-163	2.31	71.1	0.2	-	31.04
24	11:10	50	77.1	12.26	0.415	-165	2.20	69.1	0.2	-	31.11
25	11:15	50	76.7	12.26	0.413	-165	2.24	69.4	0.2	-	31.17
26	11:20	50	76.6	12.27	0.412	-166	2.21	68.0	0.2	-	31.20
27	11:25	50	76.7	12.27	0.414	-166	2.20	64.7	0.2	-	31.32
28	11:30	BUDDER									

3. SAMPLE COLLECTION DATA

Sampling Personnel: BOSSampling Method(s) & Equip: Low Flow & Budder PumpSample I.D. (Name, Date, Time): P-05/9/20/05/E 11:40Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260BSample Start Time: 11:40End Sample Time: 11:40

PID/FID READING(s): _____

PID/FID Model & Ionization Potential: _____

ODOR/SHEEN: _____

COMMENTS: Re-forming by Budder Pump at 11:30

WELL NO.: DZN-20
PERMIT NO.:

[illegible]

WELL NO.: PZN-30
PERMIT NO.:

Project No.: 05-113		Client: Beazer East	
Project Name: South Cavalcade		Project Location: Houston, TX	
Weather Conditions: Sunny : 95°F		Sampling Date: 09/17/05	

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: _____ (ft)	b. Depth to Water: <u>7.5</u> (ft)
c. Depth to DNAPL: _____ (ft)	d. Total Well Depth: <u>10.22</u> (ft)
e. LNAPL Thickness: (a-b) _____ (ft)	f. DNAPL Thickness: (c-d) _____ (ft)
g. Length of Water Column: <u>2.72</u> (ft)	(a-d) _____
h. Well Volume: <u>10.44</u> (gal)	

Conversion Factors (a x cf = h)	
Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

2. WELL PURGE DATA

a. Purge Method: <u>LOW FLOW: PERISTALTIC PUMP</u>	
b. Field Testing Equipment: <u>Horiba U-22</u>	
c. Required Total Purge Volume (1f x 2c) (gals.): _____	
d. Total Volume and Number of Well Volumes Removed: <u>≈ 4.5</u>	
e. Begin Purge Time: <u>12:05</u>	End Purge Time: <u>12:55</u>

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (± 10%)	pH (± 0.1)	Spec. Cond. (mS/cm, ± 3%)	Eh/ORP (mV, ± 10mV)	Diss O2 (mg/L, ± 10%)	TURB (NTU, ± 10%)	Salinity %	TDS G/L	Water Level (ft)
PRE-PURGE VALUES											
INT	5	400 ml/min	26.2	7.92	88.6	-135	2.13	0.0	-	-	7.41
PURGING VALUES											
1			25.3	7.75	85.9	-144	0.00	0.0	-	-	7.41
2			25.1	7.36	80.9	-131	0.00	0.0	-	-	7.42
3			25.3	7.25	77.2	-124	0.00	0.0	-	-	7.42
4			25.3	7.23	73.5	-130	0.00	4.6	-	-	7.41
5			25.4	7.31	70.5	-137	0.00	4.8	-	-	7.41
6			25.3	7.47	69.0	-147	0.00	0.0	-	-	7.41
7			25.4	7.54	67.3	-155	0.00	0.0	-	-	7.39
8			25.3	7.63	65.7	-159	0.00	0.0	-	-	7.40
9			25.4	7.65	64.9	-163	0.00	0.0	-	-	7.40
10	✓	✓	25.4	7.66	63.9	-166	0.00	0.0	-	-	7.39

3. SAMPLE COLLECTION DATA

Sampling Method(s) & Equip: <u>LOW FLOW: PERISTALTIC PUMP</u>	Sampling Personnel: <u>R. TREPET</u>
Sample I.D. (Name, Date, Time): <u>PZN-30; 09/17/05; 12:55</u>	
Sample Analytical Parameters/Method: <u>Benzene and Naphthalene via EPA Method 8260B</u>	
Sample Start Time: <u>12:55</u>	End Sample Time: _____

PID/FID READING(s):	PID/FID Model & Ionization Potential
ODOR/SHEEN:	
COMMENTS:	

Project No.:	05-113	Client:	Beazer East
Project Name:	South Cavalcade	Project Location:	Houston, TX
Weather Conditions:	SUNNY : 55°F	Sampling Date:	09/19/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a.	Depth to LNAPL:	—	(ft)	b.	Depth to Water:	5.54	(ft)
c.	Depth to DNAPL:	—	(ft)	d.	Total Well Depth:	20.36	(ft)
e.	LNAPL Thickness:	(a-b) —	(ft)	f.	DNAPL Thickness:	(c-d) —	(ft)
g.	Length of Water Column:	14.82	(ft) (a-d)				
h.	Well Volume:	2.42	(gal)				

2. WELL PURGE DATA

a.	Purge Method:	LOW FLOW PERISTALTIC PUMP
b.	Field Testing Equipment:	Horiba U-22
c.	Required Total Purge Volume (If x 2c) (gals.):	—
d.	Total Volume and Number of Well Volumes Removed:	~4 GAL
e.	Begin Purge Time:	09:20 End Purge Time: 10:00

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm ±3%)	Eh/ORP (mV ±10mV)	Diss O ₂ (mg/L ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
PRE-PURGE VALUES											
INT	5	300 mL/min	27.5	9.18	52.0	-187	5.54	0.0	—	—	6.52
PURGING VALUES											
1			28.0	9.23	45.0	-238	0.07	0.0	—	—	6.69
2			28.2	8.49	46.3	-249	0.00	0.0	—	—	6.60
3			27.9	8.07	47.9	-252	0.00	0.0	—	—	6.62
4			28.3	7.95	49.4	-252	0.00	0.0	—	—	6.68
5			28.2	7.88	51.0	-251	0.00	0.0	—	—	6.64
6			28.1	7.79	52.7	-246	0.00	0.0	—	—	6.58
7			28.0	7.70	53.6	-247	0.00	0.0	—	—	6.62
8	V	V	28.4	7.76	54.1	-250	0.00	0.0	—	—	6.61

3. SAMPLE COLLECTION DATA

Sampling Method(s) & Equip:	Low Flow Peristaltic Pump	Sampling Personnel:	R Tippet
Sample I.D. (Name, Date, Time):	PZS-305 09/19/05 10:00		
Sample Analytical Parameters/Method:	Benzene and Naphthalene via EPA Method 8260B		
Sample Start Time:	10:00	End Sample Time:	—

PID/FID READING(S) : _____ **PID/FID Model & Ionization Potential** _____

ODOR/SHEEN: _____

COMMENTS: _____



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: PZS-40
PERMIT NO.:

Project No.: 05-113		Client: Beazer East													
Project Name: South Cavalcade		Project Location: Houston, TX													
Weather Conditions: Sunny 95°F		Sampling Date: 09/17/05													
1. WATER LEVEL DATA (measured from top of inner well casing)															
a. Depth to LNAPL: _____ (ft)	b. Depth to Water: 4.93 (ft)														
c. Depth to DNAPL: _____ (ft)	d. Total Well Depth: 20.14 (ft)														
e. LNAPL Thickness: (a-b) _____ (ft)	f. DNAPL Thickness: (c-d) _____ (ft)														
g. Length of Water Column: 15.21 (ft)	(a-d)														
h. Well Volume: 2.48 (gal)															
2. WELL PURGE DATA															
a. Purge Method: LOW FLOW PERISTALTIC PUMP															
b. Field Testing Equipment: Horiba U-22															
c. Required Total Purge Volume (1f x 2c) (gals.): _____															
d. Total Volume and Number of Well Volumes Removed: ~4.5															
e. Begin Purge Time: 18:30 End Purge Time: 19:15															
<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = h)</th></tr><tr><th>Well I.D.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>1</td><td>0.041</td></tr><tr><td>2</td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>				Conversion Factors (a x cf = h)		Well I.D.	Conv. Fact. (cf)	1	0.041	2	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = h)															
Well I.D.	Conv. Fact. (cf)														
1	0.041														
2	0.163														
4	0.653														
6	1.470														
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)				
PRE-PURGE VALUES															
INT	5	45 min	29.2	10.26	29.8	-216	2.65	129.0	—	—	5.50				
PURGING VALUES															
1			28.0	9.75	26.5	-217	0.00	16.9	—	—	5.65				
2			27.9	9.38	25.4	-216	0.00	0.0	—	—	5.69				
3			28.0	9.38	32.1	-221	0.00	0.0	—	—	5.68				
4			28.0	9.18	38.5	-215	0.00	0.0	—	—	5.69				
5			27.9	8.95	40.9	-210	0.00	0.0	—	—	5.71				
6			27.8	8.78	41.6	-202	0.00	0.0	—	—	5.69				
7			27.8	8.61	42.2	-197	0.00	0.0	—	—	5.69				
8			27.8	8.58	42.4	-194	0.00	0.0	—	—	5.69				
9	✓	✓	27.8	8.51	42.6	-191	0.00	0.0	—	—	5.69				
3. SAMPLE COLLECTION DATA															
Sampling Method(s) & Equip: LOW FLOW PERISTALTIC PUMP				Sampling Personnel: P. TIPPEY											
Sample I.D. (Name, Date, Time): PZS-40; 09/17/05; 19:15															
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B															
Sample Start Time: 19:15				End Sample Time: —											
PID/FID READING(s):				PID/FID Model & Ionization Potential											
ODOR/SHEEN:															
COMMENTS:															



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: PZN-50
PERMIT NO.:

Project No.: <u>05-113</u>		Client: <u>Beazer East</u>											
Project Name: <u>South Cavalcade</u>		Project Location: <u>Houston, TX</u>											
Weather Conditions: <u>SUNNY : 90°F</u>		Sampling Date: <u>09/17/05</u>											
1. WATER LEVEL DATA (measured from top of inner well casing)													
a. Depth to LNAPL: <u> </u> (ft)	b. Depth to Water: <u>16.78</u> (ft)												
c. Depth to DNAPL: <u> </u> (ft)	d. Total Well Depth: <u>20.19</u> (ft)												
e. LNAPL Thickness: (a-b) <u> </u> (ft)	f. DNAPL Thickness: (c-d) <u> </u> (ft)												
g. Length of Water Column: <u>13.41</u> (ft)	(a-d)												
h. Well Volume: <u>2.19</u> (gal)													
2. WELL PURGE DATA													
a. Purge Method: <u>LOW FLOW PERISTALTIC PUMP</u>													
b. Field Testing Equipment: <u>Horiba U-22</u>													
c. Required Total Purge Volume (1f x 2c) (gals.): <u> </u>													
d. Total Volume and Number of Well Volumes Removed: <u>~ 2.5</u>													
e. Begin Purge Time: <u>11:05</u>	End Purge Time: <u>11:35</u>												
<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = b)</th></tr><tr><th>Well ID.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td><u>2</u></td><td>0.041</td></tr><tr><td><u>2</u></td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>		Conversion Factors (a x cf = b)		Well ID.	Conv. Fact. (cf)	<u>2</u>	0.041	<u>2</u>	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = b)													
Well ID.	Conv. Fact. (cf)												
<u>2</u>	0.041												
<u>2</u>	0.163												
4	0.653												
6	1.470												
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (S/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)		
PRE-PURGE VALUES													
INT	5	30 ml/min	27.1	8.36	0.115	-206	4.15	0.0	-	-	7.72		
PURGING VALUES													
1			25.5	8.64	0.111	-224	1.06	0.0	-	-	8.31		
2			25.5	8.57	0.110	-219	0.00	0.0	-	-	8.46		
3			25.5	8.48	0.107	-213	0.00	0.0	-	-	8.51		
4			25.4	8.42	0.104	-208	0.00	0.0	-	-	8.51		
5			25.5	8.37	0.104	-205	0.00	0.0	-	-	8.56		
6	✓	✓	25.4	8.33	0.106	-202	0.00	0.0	-	-	8.57		
3. SAMPLE COLLECTION DATA													
Sampling Method(s) & Equip: <u>LOW FLOW PERISTALTIC PUMP</u>						Sampling Personnel: <u>R. TIPPET</u>							
Sample I.D. (Name, Date, Time): <u>PZN-50; 09/17/05; 11:35</u>													
Sample Analytical Parameters/Method: <u>Benzene and Naphthalene via EPA Method 8260B</u>													
Sample Start Time: <u>11:35</u>						End Sample Time: <u> </u>							
PID/FID READING(s):						PID/FID Model & Ionization Potential							
ODOR/SHEEN:													
COMMENTS:													

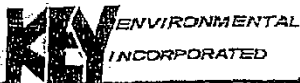


GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: PZS-60

PERMIT NO.:

Project No.:	05-113	Client:	Beazer East								
Project Name:	South Cavalcade	Project Location:	Houston, TX								
Weather Conditions:	SUNNY : 95°F	Sampling Date:	09/18/05								
1. WATER LEVEL DATA (measured from top of inner well casing)											
a. Depth to LNAPL:	—	(ft)	b. Depth to Water:	5.97	(ft)						
c. Depth to DNAPL:	—	(ft)	d. Total Well Depth:	19.60	(ft)						
e. LNAPL Thickness:	(a-b)	(ft)	f. DNAPL Thickness:	(c-d)	(ft)						
g. Length of Water Column:	13.63	(ft)	(a-d)								
h. Well Volume:	2.22	(gal)									
2. WELL PURGE DATA				Conversion Factors (a x cf = h)							
a. Purge Method:	LONG FLOW PERISTALTIC PUMP			Well I.D.	Conv. Fact. (cf)						
b. Field Testing Equipment:	Horiba U-22			1	0.041						
c. Required Total Purge Volume (1f x 2c) (gals.):	—			②	0.163						
d. Total Volume and Number of Well Volumes Removed:	2.5 GAL			4	0.653						
e. Begin Purge Time:	09:13:35	End Purge Time:	14:15	6	1.470						
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (mS/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
PRE-PURGE VALUES											
INT	5	50%	28.1	8.26	95.5	-216	5.80	46.8	—	—	6.76
PURGING VALUES											
1			28.3	7.74	91.5	-196	0.33	85.0	—	—	6.610
2			28.3	7.30	0.102 sm	-163	0.00	108	—	—	6.667
3			28.4	7.13	0.112	-152	0.00	41.3	—	—	6.667
4			28.3	7.24	0.123	-157	0.00	51.1	—	—	6.668
5			28.5	7.42	0.128	-159	0.00	56.5	—	—	6.648
6			28.4	7.43	0.130	-159	0.00	38.3	—	—	6.667
7			28.5	7.41	0.130	-157	0.00	40.1	—	—	6.667
8	✓	✓	28.5	7.40	0.131 ^N	-156	0.00	39.9	—	—	6.667
3. SAMPLE COLLECTION DATA											
Sampling Method(s) & Equip:						Sampling Personnel:					
LONG FLOW PERISTALTIC PUMP						R. HENRY					
Sample I.D. (Name, Date, Time):						PZS-60; 09/18/05; 14:15					
Sample Analytical Parameters/Method:						Benzene and Naphthalene via EPA Method 8260B					
Sample Start Time:						End Sample Time:					
7:14:15						—					
PID/FID READING(s):						PID/FID Model & Ionization Potential					
ODOR/SHEEN:											
COMMENTS: MS/MSINA - TAKEN											



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MWJ-14R
PERMIT NO.:

Project No.: 05-113 Client: Beazer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: SUNNY: 90°F Sampling Date: 09/19/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: (ft) b. Depth to Water: 16.17 (ft)
c. Depth to DNAPL: (ft) d. Total Well Depth: 46.05 (ft)
e. LNAPL Thickness: (a-b) (ft) f. DNAPL Thickness: (c-d) (ft)
g. Length of Water Column: 29.88 (ft) (a-d)
h. Well Volume: 4.87 (gal)

2. WELL PURGE DATA

a. Purge Method: LOW FLOW: PERISTALTIC PUMP
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (If x 2c) (gals.):
d. Total Volume and Number of Well Volumes Removed: 23 GAL
e. Begin Purge Time: 10:25 End Purge Time: 11:15

Conversion Factors (a x cf = b)	
Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
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INT	5	22mV/min	26.5	12.82	0.117	-200	0.65	80.0	-	-	17.31
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1			26.7	12.89	0.115	-197	0.00	87.6	-	-	17.98
2			26.4	12.51	0.104	-188	0.00	11.4	-	-	18.50
3			26.5	11.97	0.092	-164	0.00	49.9	-	-	18.59
4			26.4	10.32	0.095	-146	0.00	35.4	-	-	18.83
5			26.6	8.93	0.106	-124	0.00	28.6	-	-	18.92
6			26.6	8.09	0.111	-123	0.00	10.1	-	-	18.92
7			26.5	7.58	0.113	-118	0.00	9.4	-	-	18.96
8			26.6	7.72	0.117	-111	0.00	11.7	-	-	18.91
9			26.5	7.72	0.118	-114	0.00	10.8	-	-	18.92
10	✓	✓	26.4	7.71	0.118	-111	0.00	11.2	-	-	19.91

3. SAMPLE COLLECTION DATA

Sampling Personnel: P. TIDET

Sampling Method(s) & Equip: LOW FLOW: PERISTALTIC PUMP

Sample I.D. (Name, Date, Time): MWJ-14R, 09/19/05, 11:15

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 11:15

End Sample Time: —

PID/FID READING(s):

PID/FID Model & Ionization Potential

ODOR/SHEEN:

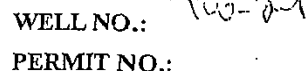
COMMENTS:



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: TW-1-1
PERMIT NO.:

Project No.: 05-113		Client: Beazer East									
Project Name: South Cavalcade		Project Location: Houston, TX									
Weather Conditions: Hot 90's		Sampling Date: 9/18/05									
1. WATER LEVEL DATA (measured from top of inner well casing)											
a. Depth to LNAPL: - (ft)	b. Depth to Water: 8.09 (ft)										
c. Depth to DNAPL: - (ft)	d. Total Well Depth: 45.2 (ft)										
e. LNAPL Thickness: (a-b) - (ft)	f. DNAPL Thickness: (c-d) - (ft)										
g. Length of Water Column: 37.11 (ft)	(a-d)										
h. Well Volume: 1.43 (gal)											
2. WELL PURGE DATA											
a. Purge Method: Peristaltic Pump / Bailer											
b. Field Testing Equipment: Horiba U-22											
c. Required Total Purge Volume (1f x 2c) (gals.): -											
d. Total Volume and Number of Well Volumes Removed: 1.54											
e. Begin Purge Time: 1717	End Purge Time: 1817	9/18/05									
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (± 10%)	pH (± 0.1)	Spec. Cond. (S/cm, ± 3%)	EH/ORP (mV, ± 10mV)	Diss O2 (mg/L, ± 10%)	TURB (NTU, ± 10%)	Salinity %	TDS G/L	Water Level (ft)
PRE-PURGE VALUES											
1727		Peristaltic Pump	UNABLE TO PULL HEAVY SED. WATER - USE BAILER								
PURGING VALUES											
		START	PAUSE	P	730						
1	1737	-	28.6	7.31	0.099	-378	0.00	7999	0.0	-	
2	1741	-	29.5	7.23	0.099	-627	0.00	7999	0.0	-	
3	1745	-	28.5	7.24	0.15	-1196	0.00	8226	0.0	-	
4	1749	-	28.7	7.28	0.15	-1200	0.00	7999	0.0	-	
5	1754	-	29.0	7.20	0.14	-1100	0.00	7999	0.0	-	
6	1759	-	29.2	7.01	0.14	-981	0.00	7999	0.0	-	
7	1803	-	29.1	6.98	0.12	-1247	0.00	901	0.0	-	
8	1809	-	29.4	6.80	0.12	-1181	0.00	840	0.0	-	
9	1817	-	28.9	6.71	0.17	-1072	0.00	754	0.0	-	DRX
→ DRX: Removed ~1.5gal: Allow Well to Recover Overnight											
	0720		29.0	7.17	0.17	-1000	0.00	450	0.0	-	17.10
3. SAMPLE COLLECTION DATA											
Sampling Method(s) & Equip: Peristaltic Pump						Sampling Personnel: BB					
Sample I.D. (Name, Date, Time): TW-1-1 / 9/18/05 / P 0720											
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B											
Sample Start Time: 0720						End Sample Time: 0725					
PID/FID Reading(s):						PID/FID Model & Ionization Potential					
ODOR/SHEEN:											
COMMENTS: Slight Bubbling w/ HCl.											

005949



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: 20-3-1
PERMIT NO.:

Project No.: <u>05-113</u>		Client: <u>Beazer East</u>											
Project Name: <u>South Cavalcade</u>		Project Location: <u>Houston, TX</u>											
Weather Conditions: <u>Sunny 95°</u>		Sampling Date: <u>9/7/05</u>											
1. WATER LEVEL DATA (measured from top of inner well casing)													
a. Depth to LNAPL: <u> </u> (ft)	b. Depth to Water: <u>16.01</u> (ft)												
c. Depth to DNAPL: <u> </u> (ft)	d. Total Well Depth: <u>20.61</u> (ft)												
e. LNAPL Thickness: (a-b) <u> </u> (ft)	f. DNAPL Thickness: (c-d) <u> </u> (ft)												
g. Length of Water Column: <u>32.5</u> (ft)	(a-d) <u> </u>												
h. Well Volume: <u>1.33</u> (gal)													
2. WELL PURGE DATA													
a. Purge Method: <u>Peristaltic Pump / Bladder Pump / Bailer</u>													
b. Field Testing Equipment: <u>Horiba U-22</u>													
c. Required Total Purge Volume (1f x 2c) (gals.): <u> </u>													
d. Total Volume and Number of Well Volumes Removed: <u>6 gals</u>													
e. Begin Purge Time: <u>1740</u>	End Purge Time: <u>1745</u> <u>9/15/05</u>												
<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = h)</th></tr><tr><th>Well I.D.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>1</td><td>0.041</td></tr><tr><td>2</td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>		Conversion Factors (a x cf = h)		Well I.D.	Conv. Fact. (cf)	1	0.041	2	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = h)													
Well I.D.	Conv. Fact. (cf)												
1	0.041												
2	0.163												
4	0.653												
6	1.470												
Read No.	Lapse Time (min.)	Purge Rate (L/min)	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)		
PRE-PURGE VALUES:													
	5		26.3	9.72	89.5	-550	2.94	7994	0.1	-	20.0		
PURGING VALUES:													
1	10		26.6	9.57	88.7	-187	0.66	7999	0.1	-	22.45		
<u>UNABLE TO PUMP w/ PERISTALTIC PUMP w/ USE BLADDER PUMP</u>													
<u>9/7/05 START PUMPING @ 1540 w/ BLADDER PUMP</u>													
<u>BLADDER STUCK w/ WHITE GRAY</u>													
	2 gals	1540	37	9.61	89.6	-100	0.71	7999	0.1	-	-		
	4 gals	1610	37.4	9.75	87.4	-90	0.41	7999	0.1	-	-		
	6 gals	1610	37.6	9.91	85.1	-110	0.21	7999	0.1	-	-		
<u>Removed 3 gals BASED ON INSTRUMENTATION T.D.</u>													
<u>SAMPLED @ 1645</u>													
<u>ABLE TO FILL ENOUGH w/ PERISTALTIC PUMP</u>													
3. SAMPLE COLLECTION DATA				Sampling Personnel: <u>W. D. Dwyer / B. J.</u>									
Sampling Method(s) & Equip: <u>PERISTALTIC PUMP</u>													
Sample I.D. (Name, Date, Time): <u>20-3-1 / 9/7/05 / @ 1645</u>													
Sample Analytical Parameters/Method: <u>Benzene and Naphthalene via EPA Method 8260B</u>													
Sample Start Time: <u>1645</u>				End Sample Time: <u>1655</u>									
PID/FID READING(s):				PID/FID Model & Ionization Potential									
ODOR/SHEEN:													
COMMENTS: <u>REACTION w/ HCL CAUSTIC EXCESSIVE BUBBLES</u>													



GROUNDWATER SAMPLE WELL NO.: TW-3-2
COLLECTION RECORD PERMIT NO.:

Project No.: 05-113		Client: Beazer East									
Project Name: South Calvacade		Project Location: Houston, TX									
Weather Conditions: Sunny 95°F		Sampling Date: 09/15/05									
1. WATER LEVEL DATA (measured from top of inner well casing)											
a. Depth to LNAPL: — (ft)	b. Depth to Water: 19.10 (ft)										
c. Depth to DNAPL: — (ft)	d. Total Well Depth: 56.74 (ft)										
e. LNAPL Thickness: (a-b) — (ft)	f. DNAPL Thickness: (c-d) — (ft)										
g. Length of Water Column: 37.64 (ft) (a-d)											
h. Well Volume: 1.5 (gal)											
2. WELL PURGE DATA		Conversion Factors (a x cf = h)									
a. Purge Method: LOW FLOW PERISTALTIC PUMP/BAILER	b. Field Testing Equipment: HORIBA U-22	Well I.D.	Conv. Fact. (cf)								
c. Required Total Purge Volume (1f x 2c) (gals.): —	d. Total Volume and Number of Well Volumes Removed: 21.6 gal	12	0.041								
e. Begin Purge Time: 5:00	End Purge Time: 16:00	2	0.163								
		4	0.653								
		6	1.470								
Read No.	Lapse Time (min.)	Purge Rate	Temp (deg. C) (±10%)	pH (s.u.) (±0.1)	Spec. Cond. (ms/cm) (±3%)	Eh/ORP (mV) (±10mV)	Diss O2 (mg/L) (±10%)	TURB (NTU) (±10%)	Salinity %	TDS G/L	Water Level (ft)
PRE-PURGE VALUES											
INT	5	330 ml/min	29.1	9.41	92.1	-570	4.70	999	—	—	23.10
PURGING VALUES											
1			30.0	9.39	93.1	-562	1.09	999	—	—	24.62
2			31.9	9.34	94.1	-461	0.49	999	—	—	25.41
3			32.3	9.37	94.1	-364	0.68	999	—	—	26.38
4			32.0	9.34	94.0	-282	0.97	999	—	—	27.20
5			32.4	9.31	94.0	-218	0.76	999	—	—	27.98
6	✓	✓	32.6	9.31	93.8	-179	0.64	999	—	—	28.00
UNABLE TO PURGE WITH PERISTALTIC PUMP —											
USED BAILER: BAILED DRY ALLOW RE-PURGE —											
1730			33.1	9.28	91.0	-211	0.54	999			—
3. SAMPLE COLLECTION DATA											
Sampling Method(s) & Equip: LOW FLOW PERISTALTIC PUMP/BAILER						Sampling Personnel: R. TIPPET					
Sample I.D. (Name, Date, Time): TW-3-2; 09/15/05; 17:30											
Sample Analytical Parameters/Method: BENZENE, NAPHTHALENE VIA EPA METHOD 8260B											
Sample Start Time: 17:30						End Sample Time: —					
PID/FID READING(s):						PID/FID Model & Ionization Potential					
ODOR/SHEEN:											
COMMENTS: AVOIDED RECHARGE DUE TO SAMPLING											



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: TW-4-1
PERMIT NO.:

Project No.: 05-113		Client: Beazer East													
Project Name: South Cavalcade		Project Location: Houston, TX													
Weather Conditions: Hot 80°		Sampling Date: 9/18/05													
1. WATER LEVEL DATA (measured from top of inner well casing)															
a. Depth to LNAPL: - (ft)	b. Depth to Water: 18.70 (ft)														
c. Depth to DNAPL: - (ft)	d. Total Well Depth: 55.5 (ft)														
e. LNAPL Thickness: (a-b) - (ft)	f. DNAPL Thickness: (c-d) - (ft)														
g. Length of Water Column: 36.9 (ft)	(a-d)														
h. Well Volume: 1.47 (gal)															
2. WELL PURGE DATA															
a. Purge Method: PAZLER															
b. Field Testing Equipment: Horiba U-22															
c. Required Total Purge Volume (1f x 2c) (gals.): -															
d. Total Volume and Number of Well Volumes Removed: 4.5 gal															
e. Begin Purge Time: 0930	End Purge Time: 1030														
<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = h)</th></tr><tr><th>Well I.D.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>1</td><td>0.041</td></tr><tr><td>2</td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>				Conversion Factors (a x cf = h)		Well I.D.	Conv. Fact. (cf)	1	0.041	2	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = h)															
Well I.D.	Conv. Fact. (cf)														
1	0.041														
2	0.163														
4	0.653														
6	1.470														
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)				
PREFPURGE VALUES															
9/18/05		HORIBA MALFUNCTION	WELL BATT WELL PRIOR TO SAMPLING												
PURGING VALUES															
		PAZLER	24.5 gal	= 7300 lbs											
		Allow well to recover - with collect GW parameters prior to													
		SAMP INK													
9/18/05	e	1835	23.0	7.80	0.108	-105	1.11	172	0.0	-	18.70				
3. SAMPLE COLLECTION DATA															
Sampling Method(s) & Equip: PERISTALTIC PUMP						Sampling Personnel: EJS									
Sample I.D. (Name, Date, Time): TW-4-1/9/18/05/Q 1840															
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B															
Sample Start Time: 1840						End Sample Time: 1850									
PID/FID READING(s):						PID/FID Model & Ionization Potential									
ODOR/SHEEN:															
COMMENTS:															



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: TW-4-2
PERMIT NO.:

Project No.: 05-113		Client: Beazer East									
Project Name: South Cavalcade		Project Location: Houston, TX									
Weather Conditions: HLT 80°		Sampling Date: 9/19/05									
1. WATER LEVEL DATA (measured from top of inner well casing)											
a. Depth to LNAPL:	-	(ft)	b. Depth to Water:	14.4	(ft)						
c. Depth to DNAPL:	-	(ft)	d. Total Well Depth:	55.7	(ft)						
e. LNAPL Thickness:	(a-b)	-	(ft)	f. DNAPL Thickness:	(c-d)	-	(ft)				
g. Length of Water Column:	41.3	(ft)	(a-d)								
h. Well Volume:	1.7	(gal)									
2. WELL PURGE DATA				Conversion Factors (a x cf = h)							
a. Purge Method:	BELLER			Well I.D.	Conv. Fact. (cf)						
b. Field Testing Equipment:	Horiba U-22			1	0.041						
c. Required Total Purge Volume (1f x 2c) (gals.):	-			2	0.163						
d. Total Volume and Number of Well Volumes Removed:	~ 2 gals			4	0.653						
e. Begin Purge Time:	0830	End Purge Time:	0900	6	1.470						
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
PRE-PURGE VALUES											
9/19/05 HORIBA MALFUNCTIONED: WELL DRY BEFORE SAMPLING											
PURGING VALUES											
REMOVED ~2 gals BEFORE TW WENT DRY ALLOW FOR RECOVERY BEFORE SAMPLING											
9/19/05	0830	23.3	7.18	0.13	-164	1.71	>999	0.1	-	15.1	
3. SAMPLE COLLECTION DATA											
Sampling Method(s) & Equip: PERISTALTIC PUMP						Sampling Personnel: BR					
Sample I.D. (Name, Date, Time): TW-4-2 / 9/19/05 / 0830											
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B											
Sample Start Time: 0830						End Sample Time: 0850					
PID/FID READING(s):						PID/FID Model & Ionization Potential					
ODOR/SHEEN:											
COMMENTS: SUPERFICIAL OF THE SAMPLE W/ HCL											



GROUNDWATER SAMPLE
COLLECTION RECORD

WELL NO.: TW-5-1
PERMIT NO.:

Project No.: 05-113 Client: Beazer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: Sunny 95°F Sampling Date: 09/14/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: (ft) b. Depth to Water: 9.64 (ft)
c. Depth to DNAPL: (ft) d. Total Well Depth: 18.01 (ft)
e. LNAPL Thickness: (a-b) (ft) f. DNAPL Thickness: (c-d) (ft)
g. Length of Water Column: 8.37 (ft) (a-d)
h. Well Volume: 0.34 (gal)

2. WELL PURGE DATA

a. Purge Method: LOW FLOW: PERISTALTIC PUMP
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (1f x 2c) (gals.):
d. Total Volume and Number of Well Volumes Removed: ~ 2 GAL
e. Begin Purge Time: 12:25 End Purge Time: 12:40

Conversion Factors (a x cf = b)	
Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
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PRE-PURGE VALUES

INT	5	350 ml/min	27.3	8.42	62.5	-83	7.28	999	—	—	12.51
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PURGING VALUES

1	↓	↓	25.2	10.37	57.1	-345	0.72	999	—	—	12.53
2	↓	↓	25.4	10.20	55.3	-327	0.00	999	—	—	12.38
3	↓	↓	25.2	10.00	54.4	-306	0.00	999	—	—	12.31

3. SAMPLE COLLECTION DATA

Sampling Personnel: R. TIPPEY

Sampling Method(s) & Equip: LOW FLOW: PERISTALTIC PUMP

Sample I.D. (Name, Date, Time): TW-5-1, 09/14/05, 12:40

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 12:40

End Sample Time: —

PID/FID READING(s):

PID/FID Model & Ionization Potential

ODOR/SHEEN:

COMMENTS: DW MEASURED FROM TOP OF CASING - STUCK UP 2.0'



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: TW-6-2
PERMIT NO.:

Project No.: 05-113 Client: Beazer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: Sunny, 100°F Sampling Date: 09/18/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: (ft) b. Depth to Water: 3.68 (ft)
c. Depth to DNAPL: (ft) d. Total Well Depth: 16.74 (ft)
e. LNAPL Thickness: (a-b) (ft) f. DNAPL Thickness: (c-d) (ft)
g. Length of Water Column: 13.11 (ft) (a-d)
h. Well Volume: 0.57 (gal)

Conversion Factors (a x cf = h)

Well I.D.	Conv. Fact (cf)
1	0.041
2	0.163
4	0.653
6	1.470

2. WELL PURGE DATA

a. Purge Method: Low Flow Peristaltic Pump
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (1f x 2c) (gals.):
d. Total Volume and Number of Well Volumes Removed: 2.15 gal
e. Begin Purge Time: 17:30 End Purge Time: 17:55

Read No.	Lapse Time (min.)	Purge Rate (min)	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
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PRE-PURGE VALUES:

INT 5 30.2 8.34 106.9 52 1.01 999 - - 6.78

PURGING VALUES:

1	30.5	8.22	106.7	31	0.00	999	-	-	7.73
2	30.7	8.03	103.9	9	0.00	999	-	-	7.43
3	30.4	7.98	104.0	-21	0.00	999	-	-	7.37
4	30.5	7.96	104.0	-28	0.00	999	-	-	7.37
5	30.0	7.92	104.0	-30	0.00	999	-	-	7.37

3. SAMPLE COLLECTION DATA

Sampling Personnel: R. Tippet

Sampling Method(s) & Equip: Low Flow Peristaltic Pump

Sample I.D. (Name, Date, Time): TW-6-2, 09/18/05, 17:55

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 17:55

End Sample Time: 18:00

PID/FID READING(s):

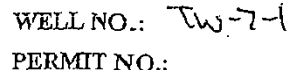
PID/FID Model & Ionization Potential

ODOR/SMELL:

COMMENTS: MS/MSD TAKEN

WELL NO.: Tw-6-1
PERMIT NO.:

[illegible]

005957



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: TW-8-1
PERMIT NO.:

Project No:	05-113	Client:	Beazer East												
Project Name:	South Cavalcade	Project Location:	Houston, TX												
Weather Conditions:	SUNNY 85°F	Sampling Date:	09/15/05												
1. WATER LEVEL DATA (measured from top of inner well casing)															
a. Depth to LNAPL:	_____ (ft)	b. Depth to Water:	15.64 (ft)												
c. Depth to DNAPL:	_____ (ft)	d. Total Well Depth:	48.05 (ft)												
e. LNAPL Thickness: (a-b)	_____ (ft)	f. DNAPL Thickness: (c-d)	_____ (ft)												
g. Length of Water Column:	32.41 (ft)	(a-d)	_____ (ft)												
h. Well Volume:	1.33 (gal)														
2. WELL PURGE DATA															
a. Purge Method:	LOW FLOW PERISTALTIC PUMP														
b. Field Testing Equipment:	Horiba U-22														
c. Required Total Purge Volume (1f x 2c) (gals.):	_____														
d. Total Volume and Number of Well Volumes Removed:	≈ 4 GAL														
e. Begin Purge Time:	10:55	End Purge Time:	11:10												
<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = h)</th></tr><tr><th>Well ID</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>(1)</td><td>0.041</td></tr><tr><td>2</td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>				Conversion Factors (a x cf = h)		Well ID	Conv. Fact. (cf)	(1)	0.041	2	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = h)															
Well ID	Conv. Fact. (cf)														
(1)	0.041														
2	0.163														
4	0.653														
6	1.470														
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)				
PRE-PURGE VALUES															
INT	5	300%/min	27.5	9.44	90.8	-572	3.04	999	—	—	16.76				
PURGING VALUES															
1	↓	↓	26.4	9.37	90.2	-584	0.21	999	—	—	17.16				
2	↓	↓	26.0	9.17	91.2	-548	0.00	999	—	—	17.22				
3	↓	↓	26.0	8.99	92.0	-487	0.00	999	—	—	17.41				
3. SAMPLE COLLECTION DATA															
Sampling Method(s) & Equip:						Sampling Personnel:									
LOW FLOW PERISTALTIC PUMP						R. TIPPET									
Sample I.D. (Name, Date, Time):						TW-8-1, 09/15/05, 11:10									
Sample Analytical Parameters/Method:						Benzene and Naphthalene via EPA Method 8260B									
Sample Start Time:						End Sample Time:									
11:10						—									
PID/FID READING(s):						PID/FID Model & Ionization Potential									
ODOR/SHEEN:															
COMMENTS:															



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: TW-9-1

PERMIT NO.:

Project No.: 05-113 Client: Beazer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: SUNNY, 95°F Sampling Date: 09/14/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: _____ (ft) b. Depth to Water: 7.59 (ft)
c. Depth to DNAPL: _____ (ft) d. Total Well Depth: 23.14 (ft)
e. LNAPL Thickness: (a-b) _____ (ft) f. DNAPL Thickness: (c-d) _____ (ft)
g. Length of Water Column: 15.55 (ft) (a-d)
h. Well Volume: 0.64 (gal)

Conversion Factors
(a x cf = b)

Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

2. WELL PURGE DATA

a. Purge Method: LOW FLOW PERISTALTIC PUMP
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (1f x 2c) (gals.): _____
d. Total Volume and Number of Well Volumes Removed: ~ 2.5 GAL
e. Begin Purge Time: 16:20 End Purge Time: 16:35

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
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PRE-PURGE VALUES

WT	5	400 ml/min	29.3	10.99	0.097	-331	4.69	999	—	—	8.69
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PURGING VALUES

1	↓	↓	29.4	10.26	0.102	-305	1.35	999	—	—	11.71
2	↓	↓	28.7	10.62	0.100	-296	0.40	999	—	—	12.50
3	↓	↓	28.6	9.13	0.100	-178	0.09	999	—	—	13.04

3. SAMPLE COLLECTION DATA

Sampling Personnel:

R. TIPPET

Sampling Method(s) & Equip: LOW FLOW PERISTALTIC PUMP

Sample I.D. (Name, Date, Time): TW-9-1, 09/14/05, 16:35

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 16:35

End Sample Time: —

PID/FID READING(s):

PID/FID Model & Ionization Potential

ODOR/SMELL:

COMMENTS:

WELL NO.: TW - 9 - 2
PERMIT NO.:

Project No.:		05-113	Client:		Beazer East						
Project Name:		South Cavalcade		Project Location:		Houston, TX					
Weather Conditions:		SUNNY : 95°F			Sampling Date:		09/14/05				
1. WATER LEVEL DATA (measured from top of inner well casing)											
a.	Depth to LNAPL:	_____	(ft)	b.	Depth to Water:	8.43	(ft)				
c.	Depth to DNAPL:	_____	(ft)	d.	Total Well Depth:	17.41	(ft)				
e.	LNAPL Thickness: (a-b) _____	(ft)	f.	DNAPL Thickness: (c-d) _____	(ft)						
g.	Length of Water Column:	8.98	(ft)	(a-d)							
h.	Well Volume:	0.37	(gal)								
2. WELL PURGE DATA											
a.	Purge Method:	LOW FLOW PERISTALTIC PUMP									
b.	Field Testing Equipment:	Horiba U-22									
c.	Required Total Purge Volume (1f x 2c) (gals.):	_____									
d.	Total Volume and Number of Well Volumes Removed:	~1 GAL									
e.	Begin Purge Time:	17:15	End Purge Time:	17:20							
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O ₂ (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
BETWEEN VALUES											
INT	5	3cm/min	29.4	7.96	0.117	-26	8.10	999	-	-	14.02
PURING VALUES:											
1			30.1	7.44	0.126	39	5.52	999	-	-	16.57
DRY - GRAB SAMPLE TOMORROW											
— 09-15 —											
			27.8	9.96	0.159	-71	6.55	287	-	-	16.01
DTW											
3. SAMPLE COLLECTION DATA							Sampling Personnel:				
Sampling Method(s) & Equip:							R TIPPET				
Sample I.D. (Name, Date, Time):							JW-9-2, 09/15/05;				
Sample Analytical Parameters/Method:							Benzene and Naphthalene via EPA Method 8260B				
Sample Start Time:							End SampleTime:				
PID/FID READING(S) :							PID/FID Model & Ionization Potential				
ODOR/SHEEN:											
COMMENTS:											



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: TW-10-1
PERMIT NO.:

Project No.: 05-113		Client: Beazer East															
Project Name: South Cavalcade		Project Location: Houston, TX															
Weather Conditions: Sunny 93°F		Sampling Date: 9/17/05															
1. WATER LEVEL DATA (measured from top of inner well casing)																	
a. Depth to LNAPL: — (ft)	b. Depth to Water: 16.66 (ft)																
c. Depth to DNAPL: — (ft)	d. Total Well Depth: 38.84 (ft)																
e. LNAPL Thickness: (a-b) — (ft)	f. DNAPL Thickness: (c-d) — (ft)																
g. Length of Water Column: 22.18 (ft)	(a-d)																
h. Well Volume: 0.91 (gal)																	
2. WELL PURGE DATA																	
a. Purge Method: Low Flow - Peristaltic Pump / Blower Pump																	
b. Field Testing Equipment: Horiba U-22																	
c. Required Total Purge Volume (1f x 2c) (gals.): —																	
d. Total Volume and Number of Well Volumes Removed: ~3 gal																	
e. Begin Purge Time: 1430 End Purge Time: —																	
<table border="1"><thead><tr><th colspan="2">Conversion Factors</th></tr><tr><th colspan="2">(a x cf = h)</th></tr><tr><th>Well I.D.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>1</td><td>0.041</td></tr><tr><td>2</td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>				Conversion Factors		(a x cf = h)		Well I.D.	Conv. Fact. (cf)	1	0.041	2	0.163	4	0.653	6	1.470
Conversion Factors																	
(a x cf = h)																	
Well I.D.	Conv. Fact. (cf)																
1	0.041																
2	0.163																
4	0.653																
6	1.470																
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)						
PRE-PURGE VALUES																	
Int	5	100% / min	30.6	9.82	0.120	-179	3.73	7999	—	—	27.79						
PURGING VALUES																	
THICK SEDIMENT - UNABLE TO PURGE																	
9/15/05																	
Int			29.7	9.78	0.118	-183	3.00	7999	—	—	23.58						
REMOVED A TOTAL OF 2 GALS.																	
- WITH CONTAINER w/ BLOWER PUMP																	
9/17/05 Resume Pumping @ 1050																	
5	500% / min		29.8	9.81	0.129	-191	3.11	7999	—	—	16.11						
10			30.1	9.61	0.120	-210	2.01	7999	—	—	16.41						
15			30.0	9.40	0.110	-220	1.47	7999	—	—	17.01						
20			30.0	9.41	0.108	-225	1.11	7999	—	—	17.11						
↳ REMOVED 73 gals WITH SAMPLE @ 1110																	
3. SAMPLE COLLECTION DATA																	
Sampling Personnel: B.B.																	
Sampling Method(s) & Equip: Low Flow: Blower Pump																	
Sample I.D. (Name, Date, Time): TW-10-1 / 9/17/05 / @ 1110																	
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B																	
Sample Start Time: 1110 End Sample Time: 1130																	
PID/FID READING(s): PID/FID Model & Ionization Potential																	
ODOR/SHEEN:																	
COMMENTS: OTW BELOW LIMIT FOR PERISTALTIC PUMP																	

PERMIT NO.:

[illegible]



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: TW-11-1
PERMIT NO.:

Project No.: 05-113 Client: Beazer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: Sunny 85°F Sampling Date: 09/15/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: (ft) b. Depth to Water: 4.15 (ft)
c. Depth to DNAPL: (ft) d. Total Well Depth: 16.64 (ft)
e. LNAPL Thickness: (a-b) (ft) f. DNAPL Thickness: (c-d) (ft)
g. Length of Water Column: 12.49 (ft) (a-d)
h. Well Volume: 0.51 (gal)

2. WELL PURGE DATA

a. Purge Method: LOW FLOW PERISTALTIC PUMP
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (1f x 2c) (gals.):
d. Total Volume and Number of Well Volumes Removed: ≈ 2 GAL
e. Begin Purge Time: 09:25 End Purge Time: 09:40

Conversion Factors (a x cf = b)	
Well I.D.	Conv. Fact. (cf)
①	0.041
2	0.163
4	0.653
6	1.470

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
----------	-------------------	------------	------------------	-----------	-----------------------	--------------------	----------------------	------------------	------------	---------	------------------

PRE-PURGE VALUES

INT	5	30 min	31.3	10.82	0.114	-545	3.09	999	—	—	7.04
-----	---	--------	------	-------	-------	------	------	-----	---	---	------

PURGING VALUES

1	↓	↓	31.2	10.09	0.122	-449	1.17	999	—	—	7.91
2	↓	↓	33.2	10.01	0.117	-176	0.36	999	—	—	7.73
3	↓	↓	31.3	10.98	0.109	-496	0.00	999	—	—	8.59

3. SAMPLE COLLECTION DATA

Sampling Personnel: R TIRPET

Sampling Method(s) & Equip: LOW FLOW PERISTALTIC PUMP
Sample I.D. (Name, Date, Time): TW-11-1, 09/15/05, 09:40
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 09:40

End Sample Time: —

PID/FID READING(s):

PID/FID Model & Ionization Potential

ODOR/SHEEN:

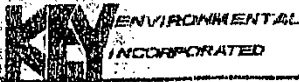
COMMENTS: FIELD DUPLICATE TAKEN



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-01
PERMIT NO.:

Project No.:	05-113	Client:	Beazer East												
Project Name:	South Cavalcade	Project Location:	Houston, TX												
Weather Conditions:	SIANNY: 95°F	Sampling Date:	04/17/05												
1. WATER LEVEL DATA (measured from top of inner well casing)															
a. Depth to LNAPL:	_____ (ft)	b. Depth to Water:	10.87 (ft)												
c. Depth to DNAPL:	_____ (ft)	d. Total Well Depth:	16.30 (ft)												
e. LNAPL Thickness: (a-b)	_____ (ft)	f. DNAPL Thickness: (c-d)	_____ (ft)												
g. Length of Water Column:	5.43 (ft)	(a-d)	_____ (ft)												
h. Well Volume:	0.89 (gal)														
2. WELL PURGE DATA															
a. Purge Method:	LOW FLOW PERISTALTIC PUMP														
b. Field Testing Equipment:	Horiba U-22														
c. Required Total Purge Volume (1f x 2c) (gals.):	_____														
d. Total Volume and Number of Well Volumes Removed:	X 23.5														
e. Begin Purge Time:	16:40	End Purge Time:	17:25												
<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = h)</th></tr><tr><th>Well ID.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>1</td><td>0.041</td></tr><tr><td>2</td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>				Conversion Factors (a x cf = h)		Well ID.	Conv. Fact. (cf)	1	0.041	2	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = h)															
Well ID.	Conv. Fact. (cf)														
1	0.041														
2	0.163														
4	0.653														
6	1.470														
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (ns/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)				
PRE-PURGE VALUES															
INT	5	300/min	30.2	7.94	78.9	-109	4.81	0.0	—	—	11.48				
PURGE VALUES															
1	1	1	28.9	7.65	87.2	-104	2.76	0.0	—	—	11.28				
2	1	1	27.1	7.45	87.8	-96	4.12	0.0	—	—	11.42				
3	1	1	27.6	7.41	87.1	-100	3.26	0.0	—	—	11.41				
4	1	1	27.6	7.39	87.0	-105	3.45	0.0	—	—	11.43				
5	1	1	27.1	7.42	86.8	-114	3.28	0.0	—	—	11.44				
6	1	1	27.0	7.61	86.9	-120	3.35	0.0	—	—	11.44				
7	1	1	27.0	7.72	86.9	-123	3.23	0.0	—	—	11.44				
8	1	1	26.9	7.77	87.1	-128	3.09	0.0	—	—	11.44				
9	✓	✓	26.8	7.76	87.4	-131	3.01	0.0	—	—	11.44				
3. SAMPLE COLLECTION DATA															
Sampling Method(s) & Equip: LOW FLOW PERISTALTIC PUMP						Sampling Personnel: R. TIPPET									
Sample I.D. (Name, Date, Time): MW-01, 04/17/05, 17:25															
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B															
Sample Start Time: 17:25						End Sample Time: —									
PID/FID READING(s):						PID/FID Model & Ionization Potential									
ODOR/SMELL:															
COMMENTS:															



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-05
PERMIT NO.:

Project No.: 05-113		Client: Beazer East													
Project Name: South Cavalcade		Project Location: Houston, TX													
Weather Conditions: Sunny 95°F		Sampling Date: 09/19/05													
1. WATER LEVEL DATA (measured from top of inner well casing)															
a. Depth to LNAPL:	(ft)	b. Depth to Water:	11.45 (ft)												
c. Depth to DNAPL:	(ft)	d. Total Well Depth:	24.28 (ft)												
e. LNAPL Thickness: (a-b)	(ft)	f. DNAPL Thickness: (c-d)	(ft)												
g. Length of Water Column:	12.83 (ft)	(a-d)													
h. Well Volume:	2.09 (gal)														
2. WELL PURGE DATA															
a. Purge Method:	LOW FLOW PERISTALTIC PUMP														
b. Field Testing Equipment:	Horiba U-22														
c. Required Total Purge Volume (10 x 2c) (gals.):															
d. Total Volume and Number of Well Volumes Removed:	~ 4 GAL														
e. Begin Purge Time:	13:15	End Purge Time:	12:55												
<table border="1"><thead><tr><th colspan="2">Conversion Factors (a x cf = b)</th></tr><tr><th>Well I.D.</th><th>Conv. Fact. (cf)</th></tr></thead><tbody><tr><td>1</td><td>0.041</td></tr><tr><td>2</td><td>0.163</td></tr><tr><td>4</td><td>0.653</td></tr><tr><td>6</td><td>1.470</td></tr></tbody></table>				Conversion Factors (a x cf = b)		Well I.D.	Conv. Fact. (cf)	1	0.041	2	0.163	4	0.653	6	1.470
Conversion Factors (a x cf = b)															
Well I.D.	Conv. Fact. (cf)														
1	0.041														
2	0.163														
4	0.653														
6	1.470														
Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (± 10%)	pH (± 0.1)	Spec. Cond. (µS/cm, ± 3%)	Ek/ORP (mV, ± 10mV)	Diss O2 (mg/L, ± 10%)	TURB (NTU, ± 10%)	Salinity %	TDS G/L	Water Level (ft)				
INT 5	300 min		25.2	7.78	74.8	-25	8.01	118	-	-	11.63				
1			25.0	7.64	74.0	-14	1.13	0.0	-	-	11.63				
2			25.2	7.52	74.1	-3	0.00	0.0	-	-	11.65				
3			25.0	7.46	74.4	4	0.00	0.0	-	-	11.65				
4			24.9	7.43	74.5	7	0.00	0.0	-	-	11.65				
5			25.2	7.49	75.2	6	0.00	0.0	-	-	11.63				
6			25.3	7.58	75.7	4	0.00	0.0	-	-	11.65				
7			25.3	7.63	76.6	4	0.00	0.0	-	-	11.65				
8			25.1	7.64	76.8	4	0.00	0.0	-	-	11.65				
3. SAMPLE COLLECTION DATA															
Sampling Method(s) & Equip: LOW FLOW PERISTALTIC PUMP						Sampling Personnel: R. JUPET									
Sample I.D. (Name, Date, Time): MW-05, 09/19/05, 1355															
Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B															
Sample Start Time: 12:45 13:55						End Sample Time: 12:55									
PID/FID READING(s):						PID/FID Model & Ionization Potential									
ODOR/SMELL:															
COMMENTS:															



GROUNDWATER SAMPLE COLLECTION RECORD

WELL NO.: MW-10

PERMIT NO.:

Project No.: 05-113 Client: Beazer East
Project Name: South Cavalcade Project Location: Houston, TX
Weather Conditions: Sunny; 95°F Sampling Date: 09/18/05

1. WATER LEVEL DATA (measured from top of inner well casing)

a. Depth to LNAPL: (ft) b. Depth to Water: 20.9 (ft)
c. Depth to DNAPL: (ft) d. Total Well Depth: 47.43 (ft)
e. LNAPL Thickness: (a-b) (ft) f. DNAPL Thickness: (c-d) (ft)
g. Length of Water Column: 26.53 (ft) (a-d)
h. Well Volume: 4.32 (gal)

Conversion Factors
(a x cf = b)

Well I.D.	Conv. Fact. (cf)
1	0.041
2	0.163
4	0.653
6	1.470

2. WELL PURGE DATA

a. Purge Method: Low Flow: PERISTALTIC PUMP
b. Field Testing Equipment: Horiba U-22
c. Required Total Purge Volume (1f x 2c) (gals.):
d. Total Volume and Number of Well Volumes Removed: 2.5 gal
e. Begin Purge Time: 11:30 End Purge Time: 12:05

Read No.	Lapse Time (min.)	Purge Rate	Temp (°C) (±10%)	pH (±0.1)	Spec. Cond. (µS/cm, ±3%)	Eh/ORP (mV, ±10mV)	Diss O2 (mg/L, ±10%)	TURB (NTU, ±10%)	Salinity %	TDS G/L	Water Level (ft)
----------	-------------------	------------	------------------	-----------	--------------------------	--------------------	----------------------	------------------	------------	---------	------------------

PRE-PURGE VALUES

WT	5	3000/min	25.8	7.53	0.131	-139	2.63	12.9	-	-	21.33
----	---	----------	------	------	-------	------	------	------	---	---	-------

PURGING VALUES

1			24.2	7.20	0.128	-143	0.00	0.0	-	-	21.46
2			24.3	7.09	0.128	-143	0.00	0.0	-	-	21.48
3			24.3	7.13	0.129	-148	0.00	0.0	-	-	21.49
4			24.5	7.28	0.129	-158	0.00	4.5	-	-	21.49
5			24.3	7.44	0.129	-166	0.00	7.7	-	-	21.50
6			24.4	7.47	0.129	-168	0.00	7.9	-	-	21.50
7	✓	✓	24.4	7.49	0.129	-170	0.00	8.0	-	-	21.50

3. SAMPLE COLLECTION DATA

Sampling Personnel:

R. TIPPET

Sampling Method(s) & Equip: Low Flow: PERISTALTIC PUMP

Sample I.D. (Name, Date, Time): MW-10; 09/18/05; 12:05

Sample Analytical Parameters/Method: Benzene and Naphthalene via EPA Method 8260B

Sample Start Time: 12:05

End Sample Time: —

PID/FID READING(s):

PID/FID Model & Ionization Potential

ODOR/SHEEN:

COMMENTS:

**APPENDIX C
CHAIN OF CUSTODY FORMS**

Chain of Custody Record

SEVERN
TRENT

STL

Sewern Trent Laboratories, Inc.

STL-4124 (0901)

Client KEY ENVIRONMENTAL		Project Manager Jim Zubren		Date 9/16/05		Chain of Custody Number 226828					
Address 1000 ARCH ST. SUITE 200		Telephone Number (Area Code)/Fax Number (409) 379-3363		Lab Number D-277		Page 1 of 3					
City CARLENE	State PA	Zip Code 15106	Site Contact B. BALKOVIC	Lab Contact V. BORTUT	Analysis (Attach list if more space is needed)						
Project Name and Location (State) WHITE CAVALCADE - HOUSTON, TX			Carrier/Waybill Number FED EX AIR 847991860978		Special Instructions/ Conditions of Receipt						
Contract/Purchase Order/Quote No. 05-113 Quote # 66505			Matrix		Containers & Preservatives						
Sample I.D. No. and Description (Containers for each sample may be combined on one line)		Date	Time	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc2	NEOH	Other
TW-10-1		9/13/05	1315	✓							
TW-3-1		9/14/05	0930	✓							
TW-3-2		9/14/05	1505	✓							
TW-8-1		9/14/05	1630	✓							
TW-7-1		9/16/05	1030	✓							
TW-1-1		9/15/05	1640	✓							
TW-4-1		9/16/05	1100	✓							
FC091605		9/16/05	0900	✓							
TW-5-1		9/14/05	1200	✓							
TW-5-1		9/14/05	1240	✓							
TW-10-2		9/14/05	1500	✓							
TW-4-1		9/14/05	1635	✓							
Possible Hazard Identification				Sample Disposal				(A fee may be assessed if samples are retained longer than 1 month)			
<input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown				<input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months							
Turn Around Time Required				OC Requirements (Specify)							
<input type="checkbox"/> 24 Hours <input type="checkbox"/> 48 Hours <input type="checkbox"/> 7 Days <input type="checkbox"/> 14 Days <input type="checkbox"/> 21 Days <input checked="" type="checkbox"/> Other Pro Contaminant											
1. Relinquished By		Date	Time	1. Received By		Date	Time				
2. Relinquished By		Date	Time	2. Received By		Date	Time				
3. Relinquished By		Date	Time	3. Received By		Date	Time				

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Slays with the Sample; PINK - Field Copy

005968



STL

Severn Trent Laboratories, Inc.

STL-4124 (0901)

[illegible]

Possible Hazard Identification			Sample Disposal			(A fee may be assessed if samples are retained longer than 1 month)		
<input type="checkbox"/> Non-Hazard	<input type="checkbox"/> Flammable	<input type="checkbox"/> Skin Irritant	<input type="checkbox"/> Poison B	<input type="checkbox"/> Unknown	<input type="checkbox"/> Return To Client	<input type="checkbox"/> Disposal By Lab	<input type="checkbox"/> Archive For _____ Months	
Turn Around Time Required					QC Requirements (Specify)			
<input type="checkbox"/> 2+ Hours	<input type="checkbox"/> 48 Hours	<input type="checkbox"/> 7 Days	<input type="checkbox"/> 14 Days	<input type="checkbox"/> 21 Days	<input type="checkbox"/> Other <u>Per Client</u>			
1. Relinquished By <u>Colin F. P. [Signature]</u>			Date <u>9/16/05</u>	Time <u>1:00</u>	1. Received By _____			Date _____ Time _____
2. Relinquished By _____			Date _____	Time _____	2. Received By _____			Date _____ Time _____
3. Relinquished By _____			Date _____	Time _____	3. Received By _____			Date _____ Time _____

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Slays with the Sample; PINK - Field Copy

005969

Chain of Custody Record



Severn Trent Laboratories, Inc.

STL-4124 (1/200)

Client W. L. LAMBERTSON		Project Manager J. M. LUBROW		Date 9/10/05	Chain of Custody Number 173845
Address 1100 AL - ST SUITE 200		Telephone Number (Area Code)/Fax Number (412) 272-3363		Lap Number 0000	Page 31 of 3

City J. LAMBERTSON	State PA	Zip Code 15106	Site Contact C. B. LUBROW	Lab Contact V. B. BORT	Analysis (Attach list if more space is needed)	Special Instructions/ Conditions of Receipt
Project Name and Location (State) South Central Houston, TX			Carrier/Waybill Number FED EX # 8479118			

Contract/Purchase Order/Quote No. PA-15, QUOTE # 66505		Matrix				Containers & Preservatives																					
Sample I.D. No. and Description (Containers for each sample may be combined on one line)		Date	Time	At	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH														
1000 Bunker		9/7/05	1100		✓						✓			✓													
TW-10-1			1110		✓						✓																
TW-3-1			1045		✓						✓																
TW-2-1			1830		✓						✓																
PIN-30			1255		✓						✓																
PIN-50			1355		✓						✓																
PIN-30			1410		✓						✓																
PIN-01			1735		✓						✓																
P25-40			1415		✓						✓																
TW-6-1			1110				✓	✓																			
RB097105			1415		✓			✓																			
TW-11		9/10/05	0700		✓						✓																

Possible Hazard Identification		Sample Disposal		(A fee may be assessed if samples are retained longer than 3 months)	
<input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown		<input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months			
Turn Around Time Required		QC Requirements (Specify)			
<input type="checkbox"/> 24 Hours <input type="checkbox"/> 48 Hours <input type="checkbox"/> 7 Days <input type="checkbox"/> 14 Days <input type="checkbox"/> 21 Days <input type="checkbox"/> Other _____					
1. Relinquished By Roberts Paul Hume		Date 9/10/05	Time 1700	1. Received By	
2. Relinquished By		Date	Time	2. Received By	
3. Relinquished By		Date	Time	3. Received By	

Comments

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

005970

Chain of Custody Record



Severn Trent Laboratories, Inc.

SFL-4124 (12/00)

Client KEY ENVIRONMENTAL			Project Manager Sam Zuprow			Date 9/30/05			Chain of Custody Number 100-16						
Address 1800 Arch St. Suite 300			Telephone Number (Area Code)/Fax Number (410) 274-3363			Lab Number PIT7			Page 2 of 3						
City PHILADELPHIA	State PA	Zip Code 15106	Site Contact B. Balke		Lab Contact V. Borciot	Analysis (Attach list if more space is needed)									
Project Name and Location (State) 2000 CANALWIDE Houston, TX			Carrier/Waybill Number 847991861535			Special Instructions/ Conditions of Receipt									
Contract/Purchase Order/Quote No. 00-13 Quote 66505															
Sample I.D. No. and Description (Containers for each sample may be combined on one line)		Date	Time	Matrix	Containers & Preservatives						Analysis				
				Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3		HCl	NaOH	ZnAc	NaOH
P-04		9/14/05	0835		✓						✓				
P-01			1040		✓						✓				
TW-10			1305		✓						✓				
PZS-60			1415		✓						✓				
R3091805			1545		✓						✓				
FO09180501			0000		✓						✓				
FO09180502			0000		✓						✓				
OW-8			1615		✓						✓				
TW-6-1			1730		✓						✓				
TW-6-2			1755		✓						✓				
TW-7-1			1820		✓						✓				
TW-4-1			1840		✓						✓				
Possible Hazard Identification				Sample Disposal				(A fee may be assessed if samples are retained longer than 3 months)							
<input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown				<input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months											
Turn Around Time Required				QC Requirements (Specify)											
<input type="checkbox"/> 24 Hours <input type="checkbox"/> 48 Hours <input type="checkbox"/> 7 Days <input type="checkbox"/> 14 Days <input type="checkbox"/> 21 Days <input type="checkbox"/> Other _____															
1. Relinquished By Sam Zuprow		Date 9/30/05	Time 1700	1. Received By		Date		Time							
2. Relinquished By		Date	Time	2. Received By		Date		Time							
3. Relinquished By		Date	Time	3. Received By		Date		Time							
Comments															

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

005971

Chain of Custody Record



Severn Trent Laboratories, Inc.

STL-4124 (1200)

Client KEY ENVIRONMENTAL			Project Manager STAN ZIMROW			Date 9/30/05		Chain of Custody Number 1-2847									
Address 500 ARCH ST. SUITE 200			Telephone Number (Area Code)/Fax Number (410) 379-3363			Lab Number 1250		Page 3 of 3									
City CAPITOL	State VA	Zip Code 15106	Site Contact B. CAVALLO		Lab Contact V. BURTON		Analysis (Attach list if more space is needed)										
Project Name and Location (State) CAVALLO HOUSE, VA			Carrier/Waybill Number FED EX # 847991861025			Special Instructions/ Conditions of Receipt											
Contract/Purchase Order/Quote No. 66504			Matrix						Containers & Preservatives								
Sample I.D. No. and Description (Containers for each sample may be combined on one line)			Date	Time	Aqueous				Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc2	NaOH
Tw-4-2			9/19/05	0730	✓									✓			
P-25-30				1000	✓						✓						
P-02R				1415	✓						✓						
P-02R				1250	✓						✓						
P-02-05				1355	✓						✓						
P-02-25				1440	✓						✓						
P-02-26				1530	✓						✓						
P-02-26			9/30/05	0700	✓						✓						
P-03R				0400	✓						✓						
P-01				1005	✓						✓						
P-05				1110	✓						✓						
P-05				1230	✓						✓						
P-05				1410	✓						✓						

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____
 QC Requirements (Specify)

1. Relinquished By Stan Zimrow	Date 9/30/05	Time 1700	1. Received By	Date	Time
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

005972



*200 Third Avenue
Carnegie, Pennsylvania 15106
Phone: (412) 279-3363
Fax: (412) 279-4332*

Branch Locations:

*456 Route 22 West, Suite D
Whitehouse Station, New Jersey 08889
Phone: (908) 534-4501
Fax: (908) 534-6785*

*185 Lancaster Street, Suite 304
Portland, Maine 04101
Phone: (207) 772-8100
Fax: (207) 772-8101*